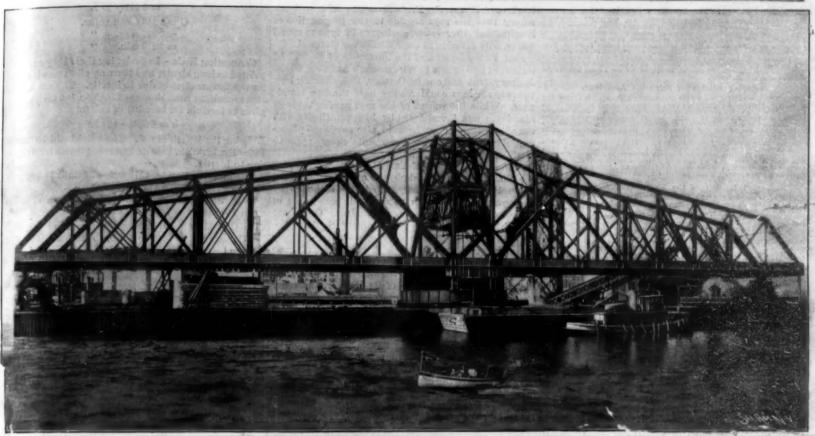


A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

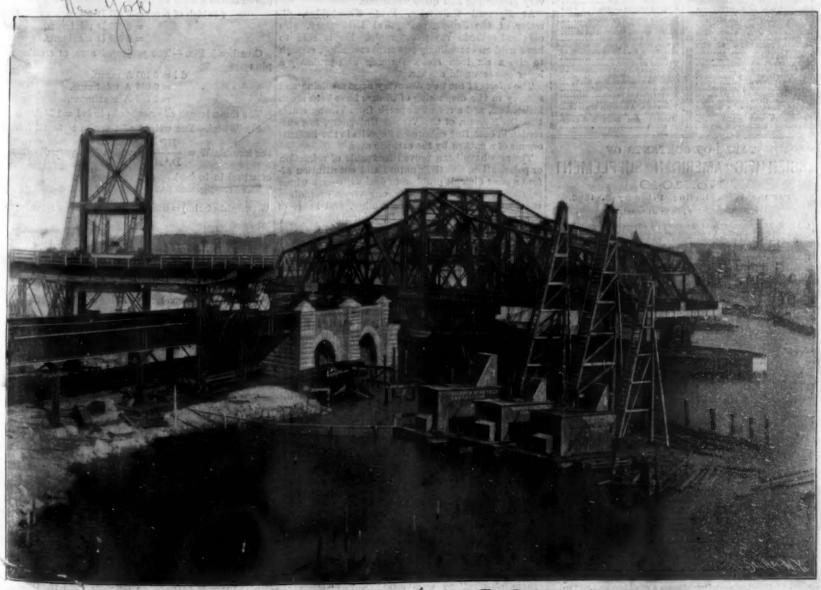
Vol. AXXIV.-No. 6.

NEW YORK, FEBRUARY 8, 1896

[\$3.00 A YEAR. WERKSY.



NEW FOUR TRACK RAILROAD DRAWBRIDGE FOR NEW YORK CITY.



THE DRAW SPAN OF THE FOUR TRACK HARLEN RIVER BRIDGE, STONE ABUTMENT, AND ELEVATED ROADBED.

NEW HARLEN RIVER BRIDGE AND PARK AVENUE IMPROVEMENT, NEW YORK CITY.—[See page 88.]

Scientific American.

ESTABLISHED 1845

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

The Scientific American Supplement

a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT issued weekly. Every number contains 15 octavo pages, uniform in size to SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, by a year, for the U. S., Canada or Mexico. Sail a year to foreign untries belonging to the Postal Union. Studie copies 10 cents. Soid all newsdesires throughout the country. See prospecial SCIENTIFIC ASSETTION OF THE SCIENTIFIC ASSETTION OF SUPPLEMENT OF SCIENTIFIC ASSETTION OF SCIENTIFIC A

Building Edition of Scientific American.

Building Edition of Scientific American.

CILDING EDITION OF THE SCHENTIFIC AMERICAN is a large and by illustrated periodical, issued monthly, containing floor plans precive views pertaining to modern architecture. Each number ated with beautiful plates, showing desirable dwellings, public and architectural work in areat variety. To builders and all who late building this work is invaluable. Has the largest circulation chifectural publication in the world.

Discourage of the Control of the United States, Canada on Fish and Control of the United States, Canada on Fish and Control of the United States, Canada of the Control of the United States of the Control of the Control of the United States of the Control of the United States of the Control of the Contr

CHEST IFFCA E [NIOSTRIAL," or HICAN, published monthly, uni-TIFFC AMERICAN. Every num-trated. It is the finest actiontific, evaluates throughout Cobe, the north published in the color, and published in the color, and the guaranteed circulation in all 88.00 a year, post paid to any

odesire to secure foreign trade, may ed announcements published in this MUNN & CO., Publishers, 361 Broadway, New York.

est way to remit is by postal order, express money order, check. Make all remittances payable to order of MUNN are specially requested to notify the publishers in case of iay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, FEBRUARY 8, 1806.

(Hiustrated articles are	marked with an asteriak.)
Air mattresses and Hie-preserv- are proposed and Hie-preserv- be and his-preserve- flowing and his	Media for epeed Hiles records. Various. New York City, Fourth Avenue, Improvements Patents are and weekly record. Photography a time measure- ments Provide and the measure- ments Research and the meas
Guns, the power of	Trees, a California great*
Light house, Cape Hatters 98 Light, Hoentgen's discovery about	Typewriter inks
Locomotive bailding, 1986	Waterproofing brick and sand-

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT No. 1049.

For the Week Ending February 8, 1896.

Price 10 crats. For sale by all newsdeals

ASCHITECTURE - Cassis Architecture, From the point of view of an architect. A discourse before Johns Hopkins University, at Baltimore, Md.—By HENRY VAN BRUNT.—A very exbansitive review of the architectural genius of the Greeks.—First installment of this important lecture.

II. CHEMISTRY.—Heliam.—Note by the great physicist Lord Kelvin on the new element.

III. CIVIL ENGINEERING.—New Pumping Engines, Colchester Water Works.—Compound condensing engines, Concentry installed in Colchester, England.—Dimensions and performance.—I illustration.

Malfer in Concessor, and the Market in Concessor, and Mantie for Protecting River Banks.—An English contribution to the Insurvement of river navigation. I illustrations. Water Motors and their Puwer.—By G. D. HISCOX, M. K.—A practical and vausable paper on the subject of small water power for machinal statement of the Market Statement of th

IV. DIA WING. Automatic Centering Compasses.—A neeful instrument for mechanical draughtamen and in mechanical construction and byther masting.—Illustrations.

V. ELECTRICITY.—The Arc Light.—Lecture II.—By Professor SILVANCE.—P. TROMPSO.—The second of this most important series of lectures.—The option of the arc, distribution of its light and VI. ENTOMOLIONY.—A New Cabbase Pred.—A cabbase series.—A new and desired cactive insect, and how it is to be coped with.—A cariosity on the coast of Norway.—As island pierced by a long transcrements and description.—Situatrations.—The Transcral.—Full account of the history, seography, and resources of the Transcral.—Illustrations.

VII. M. RETHANICAL ENGINEERING.—Clans Water Gage Protector.—Siteleding of a glass water ange to protect the engineer from injury in case of brunking.—Illustration.

AND SUAGERY

of tree growth. - Vegetable growth raisis concer, - Himatration

XL SAVAL ENGINERALION

The Performance of Comm Meanships the bistory of steman navigation in regular to the state of the bistory of steman ravigation in regular of the state of the bistory of steman ravigation of the state of

PHOTOGRAPHY. - Br

PROF. ROENTGEN'S DISCOVERY.

The now famous Roentgen's discovery has been still further described, the accounts have assumed better shape, and his experiments have been repeated in this country by some of our leading physicists. It was on January 4, at the celebration of the semicentennial of the founding of the Berlin Physical Society, that Prof. Roentgen described his discovery, which had been accomplished only a few days before, detailing his results and presenting proofs of his photographs. The paper covered substantially the ground gone over by us in our last issue. The rays emanating from the cathode of a Crookes tube were used, and in their new role were named "X Strah len," or "X rays." Prof. Roentgen advanced the theory that the rays are due to the propagation of longitudinal ether waves, analogous in type to sound waves, only differing in their medium or material.

Prof. Philip Lenard, of the University of Bonn, had published two papers in Wiedemann's Annalen, one in January, 1894, and one in October, 1895, showing how the cathode rays could readily pass through aluminum. While the course of the rays passing through aluminum was investigated by him, principally with the aid of fluorescence, he used also sensitized photographic plates. He obtained results closely approximating those of Prof. Roentgen.

Prof. A. W. Wright, of Yale University, occupying due to inertia. the chair of experimental physics and director of the Sloan Physical Laboratory, tried the cathode ray photography with much success. He got prints of various objects through opaque screens. One point brought out is, that while it is distinctly shadow pho tography, it is so with a difference-it is not merely silbouettes that are imprinted. The effect of the rays upon the photographic plate varies with the nature and thickness of the object through which they pass so that some representation of its contour and inner structure can be obtained.

One of Prof. Roentgen's exhibits was the photo- 0.192 and 0.417. The mean value gave the following graph of the skeleton of a hand taken from the living hand, the point being that the bones produced a denser "shadow" than did the flesh. This differential action has enabled an aluminum medal to give an image showing its lettering and design. An attempt to take the skeleton of the hand at Yale resulted, it is said, less favorably than with Prof. Roentgen. Prof. Wright's other results were most satisfactory. He found that glass was more opaque to these rays than was ebonite, that aluminum was more transparent than other metals, and his photographs were very interesting and quite numerous.

At Harvard University, Prof. Trowbridge, director of the Jefferson Physical Laboratory, also obtained cathode ray photographs. He is said to have used an exceedingly powerful excitation, enough to give a six inch spark through air; probably a lesser power would answer.

The effects of the new discovery upon medicine and surgery in the diagnosing of disease have been much insisted on, and a recent dispatch from Vienna states that Dr. Neusser, of the Vienna University, has succeeded in detecting calcareous deposits in the internal organs of a patient by the cathode rays,

The rays have been proved incapable of refraction or polarization, and their nature and constitution afford a most difficult problem to deal with-one whose solution may greatly modify our views of radiant energy and of the luminiferous ether, and hence of cosmic questions of the utmost magnitude.

THE PROPORTIONS OF HIGH SPEED ENGINES.

At the meeting of the American Society of Mechanical Engineers held in New York during December, 1895, a valuable paper on the above subject was read by Mr. John H. Barr, of Ithaca, N. Y. The experimental work of which the paper treats, we are told, was carried out by Messrs, F. F. Gaines and H. E. Williams, as the basis of a thesis presented upon graduation at Sibley Jollege, Cornell University.

To secure the data upon which to make the examina tion, a printed circular was forwarded to the principal makers of high speed engines, with the result that the available data covered about 75 engines by a dozen different builders; the sizes ranging from 25 to 225 rated horse power.

used:

D = diameter of piston; A = area of piston; L =pounds per square inch above exhaust, as a standard pressure; H P = rated horse power; N = revolutions per minute; C = a constant. All dimensions are given in inches.

In carrying out the investigation, the various dimensions received from the makers for any one given part of an engine were plotted on cross section paper and curves of dimension drawn. A line representing the mean and two lines representing the extremes of these observations were established. "From the represent the average and extremes of practice." The at Antwerp.

resulting values for the constant C give the following formulas :

Crank Shaft .- d = diameter of shaft.

 $d = 7.56 \sqrt[6]{H P + N}$

(the value of C ranging between 8.76 and 5.98) where 7.56 is the mean value of constant. The diagram gave a maximum of 8.76 and a minimum of 5.98 as the value of C.

Example: If a high speed engine develops 100 horse power at 250 revolutions per minute, we get by using mean value of C:

d (dia. of crankshaft) = $7.56 \sqrt[8]{100 + 250} = 5.57$ inches. Piston Rod.-

 $\mathbf{d} = \mathbf{C} \sqrt[4]{\mathbf{D}^g \, \mathbf{L}^g}$ = 0.145 \(\overline{D} \overline{L} C = 0.145 mean value. = 0.177 max.

Connecting Rods.-In designing these they are calculated as long struts; and then an allowance is made for the flexure stresses due to inertia. The mean constant resulting from this examination is 0.0545, which gives as formula for breadth of rod (b)

= 0°119 min.

$$b = 0.0545 \sqrt{D L^1}$$

L1 being the length of rod. The height will be made twice the breadth, plus an excess to provide for stresses

The investigation for this ratio of height to breadth of rod gave the mean value h = 2.78b.

Main Journals.-For the projected area of each main bearing, the formula is

dl = C A (d being diameter; l, length of journal) C ranges from 0.367 to 0.739, the mean being 0.489, then d l = 0 489 A.

Crank Pin.-Working upon the formula

 $1 = C \frac{HP}{L}$ the constant was found to vary between

equation:

$$1 = 0.333 \left(\frac{HP}{L}\right) + 2.2$$
 inches.

In noting that these expressions vary in form from the fundamental formula, the author explains that "the two extreme lines of the diagram have ben determined upon the proportions of only two mk The diagram shows a wide variety of pract

For projected area of crank pin, d l = 0.22 A. Face of Piston.-The ratio of diameter to fac of

piston shows a wide variation.

f (width of face) = 0.437 D mean. = 0.300 D minimum. = 0.650 D maximum.

Crosshead Pin. - The projected area of crossle pin:

d l = 0.105 A mean. = 0.066 A minimum. = 0.346 A maximum.

The mean length of crosshead pin is l = 1.33 d.

Fly Wheel.-The weight of the rim is found from

HP the formula $W = \frac{M^2}{D_1^9 N^9}$ (in which D_1 equals diameter

of wheel in inches).

The investigation gave

W (weight of rim) = 833,000,000 $\frac{\text{HP}}{\text{D}^2\text{N}^2}$ for the mean

= 344,000,000 $\frac{\mathrm{HP}}{\mathrm{D}^2\mathrm{N}^2}$ for the minimum $= 2,780,000,000 \frac{{\rm HP}}{{\rm D}^{0}{\rm N}^{2}} \mbox{for the maximum}$

The average linear velocity of the rim of wheels was found to be 4,200 feet per minute. Weight of Reciprocating Parts.-For smoothness of

running, the weight (W) should be proportional $\frac{D}{LN^2}$

The result obtained was W = 1,850,000 -

Weight of Entire Engine per Horse Power.-The average weight of high speed engines per horse power (W) is given by formula $W=117\,(HP)-820$ pounds.

The value of, and the necessity for, such an investi gation as this is proved by the wide divergence shown by the various engines from the mean dimensions as length of stroke; 8 = steam pressure, taken at 100 ascertained. That two makers of high speed engines of the same H.P. should use two fly wheels with a difference in the weight of rim of 1 to 8 (see above) is one of those anomalies that are continually to be met with when designing is carried out on the "rule of thumb"

ANTWERP is becoming a rival of London for the ivory trade of the world. A report from the British consul general at Antwerp shows the large extent to which ivory is brought to Belgium from the Congo. 1888 equations of these lines formulas are derived which The ivory industry has of late sprung into new life

World's Shipping in 1895.

annual summary of shipbuilding prepared by Llove's Register of British and Foreign Shipbuilding been issued. It shows, says the New York hat the total output of the world in 1895, not inng warships, was about 1,218,000 tons, 104,000 of elu neing about the total sail tonnage for the year. as has been officially recorded, the amount of As ing tonnage totally lost in the twelve months 100,000 tons, 200,000 steam and 410,000 sail.

in these figures it can be seen that the world's g tonnage has been reduced 306,000 tons during the year, and the steam tonnage has increased about

824

() the new tonnage launched, England has acquired 62.5 per cent. There were launched in England last year 579 vessels, a total of 950,967 tons. Of that number 526 were steam and 58 sailing vessels. In the same period fifty-nine warships were launched in England, including the output from both government and privale yards. The total output for the year from British shipyards is about 95,000 tons less than for 1894, but the proportion of steam tonnage to sail has materially

In 1892 sailing tonnage formed about 24 per cent of the output; in 1895 it formed about 5 per cent. These comparisons show the remarkable decline in the sailing tonnage of the world.

The summary also says that 98 per cent of the steam tonnage and 97 per cent of the sailing tonnage was built of steel. The largest steamers launched in the year were the Georgic, 10,077 tons; Victorian, 8.767 tons; and Armenian, 8,765 tons. The largest sailing vessel was the Iranian, 2,958 gross tonnage.

The table which follows shows the number of vessels, merchant and warships, and their tonnage, built in the United States and other countries outside of England. It includes every vessel above 100 tons, and is considered the most complete record ever compiled. It is as

Countries.	No.	Varships. Tone dis.	warsh	nerchant and hips built in country. Tons.
United States	8	12,084	64	96,911
Austria-Hungary	2	11,100	19	18,471
Beiginm		-	1	1,970
British colonies		-	80	10,381
Denmark	****	-	14	10,982
France	7	42,071	84	70,922
Germany	8	6,340	78	94,126
Holland	2	1,155	27	9,447
Italy		18,340	12	18,948
Japan		2,800	4	5,096
Norway		-	91	19,873
Russia		2,774	19	5,009
Spain	1	9,000	9	9,910
Sweden		-	13	9,707
Total	13	100,614	204	367,807

While the total output from American shipyards for the year is placed at 96,411 tons, the output from yards in the United Kingdom was about 950,000 tons. About 20 per cent of the vessels launched in England were for foreign countries, and of the vessels built 60 per cent were launched in the Greenock district. It is estimated that England sold 386,000 tons to foreign owners, and of this amount more than one-fourth went under the Japanese flag, which shows how the Japs are building up their naval and merchant

The records shows that the largest vessels launched outside of England were the German bark Potosi, 4,027 tons, and the French bark Wulfrau Puget, 3,062 tons. These vessels were built under the supervision of Lloyd's Register.

Torpedo Boat Eriesson.

Secretary Herbert recently decided that he would direct the preliminary acceptance of the torpedo boat Ericsson, subject to another dock trial, the sum of \$16,000 to be deducted, however, from the contract price, for failure to complete the vessel within the required time. The Ericsson is now at New London, Connecticut, and the trial will take place there. It is not unlikely that, owing to the unfortunate accidents which caused the delay in completion, Congress will authorize the remission of the \$16,000.

The Ericsson has had a number of trying experiences. Accidents to her machinery caused great delay, and ton Point, L. I. on her last attempt at an official trial several men were The department is now satisfied that the machinery of amateurs; both with seven turns. the little vessel is in perfect order, and that she can make twenty-five knots an hour, which is a half knot more than required by the contract. The Ericsson was built by the Iowa Iron Works, Dabuque, Iowa.

Kilauca Volcano in Eruption.

After thirteen months of quiescence an eruption of this volcano commenced on January 3, the liquid lava than 450 feet higher, and the surface of the burning

Various Mile Records

A mile is not a thing requiring such an extraordinary time to cover, provided the coverer of it is properly equipped with a sufficiency of speed-producing powers. Below is given a partial list of some exceedingly speedy milers and their performances, and some slow but sure travelers as well:

Light-0.000005102 of a second, or 196,000 miles in one second.

Electricity-0.00000347 of a second, or 288,000 miles per second.

Earthquake-1/2s., as calculated by delicate instru ments, or around the world in 31/2 hours.

Sound in Water-1s., or 4,900 feet in one second.

Cannon Ball--1 6-10s., if it traveled at the muzzle velocity of 3,300 feet per second obtained by some

Sound in Air-5s., or 1,000 feet in one second.

Birds-18s. It is said the frigate bird flies 200 miles an hour; a mile in 24s. by the kestril, or sparrowhawk, which is said to fly 150 miles an hour; in 1m. 9s. by a pigeon, when flying 200 miles in an actual race; in 1m. 151/s. by a pigeon when flying 400 miles in an actual race.

Railway Train-32s., in May, 1898, the Empire State Express, of the New York Central and Hudson River Road, drawn by engine "999," with Engineer Hogan, near Crittenden, N. Y., or a rate of 1121/2 miles in an

Duck-40s, or 90 miles an hour.

Electric Railway-59s., on the Baltimore and Ohio Railway, at the Baltimore Tunnel in September, 1895. Ice Boat-1m., at Newburg Bay, Hudson River.

Tandem Blcycle on Straightaway Road-1m. 171-5s. on December 16, 1895, on a straightaway road built for the purpose at Cheynne, Wyo., with a wind blowing 30 miles an hour, by two riders, John Green and Charles S. Erswell.

Bicycle Straightaway-1m. 25s., John Green, Cheyenne.

Horse Running-1m. 351/s., by Salvator, at Monmouth Park, August 28, 1890.

Bicycle on Track-1m. 40 3-5s., by P. J. Berlo, New

Orleans,

Dog.-1m. 43 1-5s., if the greyhound coursed one mile, the usual distance of 200 yards having been run in 11368.

Boat-1m. 45s., torpedo boat Sokol, made by Messrs. Yarrow, of England, for Russia, and which developed in October, 1895, a speed of 34 miles an hour. Steam ship Lucania in 2m. 18 4-5s.

Bicycle Quadruplet-1m. 47 4-5s., on October 17, 1895. at Denver, Col, unpaced, flying start, Connibear, Dickson, Stone, and Swanbrough.

Bicycle Tandem on Track-1m. 52%s., on October 27, 1894, at Waltham, Mass, flying start, paced, Haggerty and Williams; on August 17, 1894, at Denver, Col., flying start, unpaced, Titus and Cabanne, in 1m. 55 1/4 s.

Horse Pacing-2m. 11/2s., by Robert J., at Terre Haute, Ind., on September 14, 1894, against time.

Bicycle Triplet-2m. 14 5s., unpaced, standing start,

Kennedy, Murphy and Saunders.

Horse Trotting-2m. 3%s., by Alix, at Galesburg Ill., September 18, 1894.

Horse Team Trotting-2m. 121/4s., by Belle Hamlin and Honest George, driven by E. F. Geers, at Providence, R. I., September 28, 1892.

Man Skating-2m. 12 8-5s., by J. F. Donoghue.

Horse Under Saddle-2m. 13s., by Johnson, pacing at Cleveland, O., August 3, 1883, against time; in 2m. 15%s., by Great Eastern, trotting at Fleetwood Park, September 22, 1877.

Crow-2m. 40s., or 25 miles an hour.

Horseless Carriage-4m., a carriage running 750 miles, from Paris to Bordeaux, in the international race of 1895, or 15 miles an hour throughout.

Man Running-4m. 123/4s., professional, W. G. George; in 4m. 174 5s., amateur, T. P. Conneff.

Man Rowing-5m, 1s., by Ellis Ward, on the Savannah River, Florida, April 1, 1872.

Man Walking-6m. 23s., professional, W. Perkins, of England; in 6m. 29 3-5s., amateur, F. P. Murray, of the United States.

Canoe-6m. 40s., July, 1894, by C. E. Archibald, at the fifteenth annual meet of the A. C. A., held at Cro-

Man Swimming-27m. 21 2-5s., J. H. Tyers, Englishkilled by an explosion and the trial was abandoned. man; in 28m. 55 2-5s., G. Whitaker, American; both

1895, paddling in a tub 6 miles in 7 hours.

As will be seen by a study of the above list, in the wherein man is a factor, the bicycle is beaten only by the railway train, the electric railway, and the ice boat, and its nearest competitor is the running horse, and he is 18 seconds slower. Relatively, it seems as rising the next day to the top of the wide shaft at the though it were impossible for the bicycle to attain a bottom of the pit and forming a burning lake 200 feet higher position in the speed world, 171/4 seconds sepalong by 150 feet wide. The upper rim of the pit is more rating it from its nearest leader, the ice boat, a lead lake, should it reach the top, will then be much is accepted that anything in the speed line is a cycling 1,100, as against 605 in 1894. The freight cars built in impossibility.—The Wheel.

Photography and Chronographic Measurements.

The British Journal of Photography says 'A note on this subject, from a lecture by Mr. Frederick J. Smith, appears in a recent number of Nature. In order to avoid the error of 'time-lag,' introduced by the use of magnetic and solenoidal arrangements, he has devised a method based entirely on the use of Two sources of light at a suitable distance apart throw two beams of light on to a sensitive plate, carried in the carriage of a tram chronograph. By means of lenses the beams of light are caused to form two sharp images on the plate in a vertical line, one above the other, a tuning fork trace is also made on the plate; if the plate traverses when the beams of light are not interrupted, on development two black parallel lines appear on the plate; but if during the passage of the plate the beams of light are cut by any solid object which shuts off the light, then, on development, two gaps are seen to exist. The distance between these markings, when interpreted in terms of the fork trace, gives the velocity of the object which

cuts through the beam of light. "In another method, the projectile cut during its flight through two thin screens, placed in the paths of the beams, and so opened a passage for the light. Two parallel lines are then formed on the plate, one longer than the other; the difference in their lengths duly interpreted gives the velocity of the projectile. new mode of registering velocities would seem to be very valuable, as the most exact determination of the rapidity of the flight of projectiles at various stages in of great importance in artillery investigations,

Diminution of Risks with Electric Lighting.

The following suggestions are offered by the American National Board of Fire Underwriters to people who are about to employ electric lighting:

1. Have your wiring done by responsible parties, and make contract subject to underwriters' rules. Cheap work and dangerous work usually go hand in hand.

2. Switch bases and cut-out blocks should be noncombustible (procelain or glass).

8. Incandescent lamps get hot; therefore all inflammable material should be kept away from them. Many fires have been caused by inflammable goods being placed in contact with incandescent lamp globes and

4. The use of flexible cord should be restricted to straight pendent drops and should not be used in show

5. Wires should be supported on glass or porcelain and never on wooded cleats; or else run in approved

6. Wires should not approach each other nearer than 8 inches in arc and 214 inches in incandescent lighting. 7. Wires should not come into contact with metal

8. Metal staples to fasten wires should not be used.

9. Wires should not come into contact with other substances than their designed insulating supports. 10. All joints and splices should be thoroughly sold-

ered and carefully wrapped with tape. 11. Wires should always be protected with tubes of

glass or porcelain where passing through walls, partitions, timbers, etc. Soft rubber tube is especially dan-

12. All combination fixtures, such as gas fixtures and electric lamps attached, should have approved insulating joints. The use of soft rubber or any material in such joints that will shrink or crack by variation of temperature is dangerous.

18. Electric gas lighting and electric lights on the came fixture always increase the hazard of fire and should accordingly be avoided.

14. An electric arc light gives off sparks and embers. All are lamps in vicinity of inflammable material should have wire nets surrounding the globe, and such spark arresters reaching from globe to body of lamp as will prevent the escape of sparks, melted cop-

per and particles of carbon. 15. Arc light wires should never be concealed.

16. Current from street railway wires should never be used for lighting or power in any building, as it is extremely dangerous.

17. When possible, the current should be shut off by a switch where the wires enter the building when the lights or power are not in use.

18. Remember that "resistance boxes," "regulators," "controllers, "rheostats," "reducers" and all such Man in Tub-1h. 10m., by Gus Frates, in Oregon, in things are sources of heat and should be treated like stoves. Any resistance introduced in an electric circuit transforms electric energy into heat. Electric case where figures are given of speed production heaters are constructed on this principle. Do not use wooden cares for these stoves, nor mount them on woodwork.

Locomotive Building, 1895.

All of the thirteen locomotive building companies in the United States, except one, says the Railroad Gazette, turned out more locomotives in the past than which looks almost impossible to overcome, if the idea in the previous year, the total number having been 1895 were 31,803, as compared with 17,029 in 1894.

pany with each other. The

claim made for the St. Paul and

for her sister ship, the St. Louis,

is that they are remarkably fast

in a seaway, it being generally

conceded that the larger Cam-

pania is faster in smooth water.

For some reason both ships got

far south of their reckoning, and

approaching the American coast

in a dense fog, headed straight

for the New Jersey coast at

Long Branch, fifteen or twenty

miles south of their proper posi-

tion. The lead was kept going

on both ships, but in spite of

the frequent soundings, the St.

Paul, at 1:47 A. M., January 25,

ran aground on the beach at

Long Branch, near the Iron

while the Campania, some

three miles to the south, barely es-

of the disaster and have made strenu-

ous efforts to pull the ship off, but the

want of sufficiently high tide has mili-

of the stranded ship as she lay al-

most broadside on to the beach. Long

Branch is one of the great summer

resorts of New Yorkers and is within

easy reach of the city. The trains

running there have done a heavy busi-

ness in the transportation to Long

Branch of people desirous of seeing

the stranded vessel. Thousands have

gone there, and the place, ordinarily

deserted at this season, has presented

a scene of life and animation very

foreign to the senshore in the month

A telephone station was established on the ship, so as to keep her in con-

stant communication with the outer

world. As she lay on the beach, the

wire of the telephone line, running

from a pole on shore to the ship rail,

has been her only connection with the

land. It seemed a curious illustration

of fin-de-siécle advancement, the es-

We present our readers with a view

tated against their efforts.

The wreckers were at once notified

Pier,

caped a like fate.

AN IMPROVED PROPELLING MECHANISM.

The accompanying illustrations represent improved means for the propulsion of bicycles, railway veloci- that runs to the pilot wheels' truck. When the pilot umns of the daily press. Starting from Southampton, pedes, and hand cars, showing also the position and appearance of the mechanism when adapted to the ahead, and this moves the rod and chain enough to making a fast passage across. When partly across, bicycle and velocipede car. The improvement forms move the headlight so that the reflection is cast direct- the Campania, of the Cunard Line, appeared on the the subject of a patent recently issued to James J. ly ahead on the track. Out of the total of 1,650 rail- scene, and for many hours the two ships were in com-

Thompson, of Jacksonville, Fla., of which the object is to increase the power of propulsion of either class of cars or bicycle, by utilizing power generated through the instrumentality of a flywheel, and at the same time proportionately lessen the muscular exertion on the part of the operator. The sectional view represents the mechanism and its working, the device being attached to the frame bar for use on either style of car, or to the tubular frame of the bicycle. The hubs of the cranks, secured to the crank shaft, are journaled in ball bearings adjustable in bangers, and a large gear secured to the crank shaft meshes with

the smaller gear of a compound gear revolving on ball bearings. The larger of the compound gears meshes with a mall gear on the hub of the flywheel, revolving freely on ball bearings on the crank shaft. A sprocket wheel on the crank shaft connects in the usual way by an endless chain with a sprocket on the driven wheel.

By rotating the crank shaft, as in driving the ordinary bicycle, the gears are made to also revolve the flywheel, and power is thus accumulated. For hand cars, motion is obtained by the use of the ordinary lever and rods conpecting it with the cranks, which, by their simultaneous action, convert the reciprocal motion of the lever into the rotary motion of the cranks. The flywheel is made to revolve many times oftener than the crank shaft through the medium of the compound gears, and, when once the power in properly adjusted, it is a simple matter to gear the speed of the bieyele to any pitch desired, and of either class of cars sufficiently to maintain the same upon the track with safety. At no period in the revolution of the cranks is there a diminution of power applied to the crank shaft through the lack of leverage force, as the increased momentum gained in the flywheel develops power sufficient to eliminate

over dead centers, thus perpetuating the constant otherwise be retarded by sacrificing a sufficient amount of the speed power in rotating the cranks to the initial point of leverage

Velocipede and hand cars equipped with this mechanism are also provided with patent roller bearing

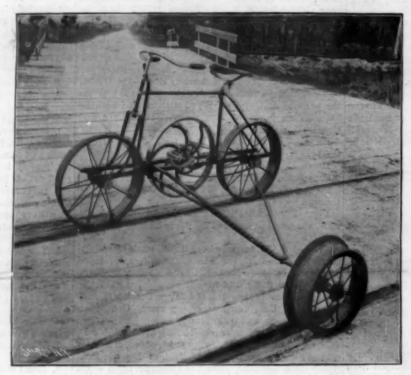
axle bexes, in the chamber of which the wheel axle of the car is made to revolve freely without friction. One of our views is a reproduction from a photograph taken of a velocipede car upon the track in actual service equipped with this mechanism, and another is a side view representing the mechanism in place on a bicycle.

A Novel Headlight.

An Englishman bas invented an automatic headlight. In going around curves headlights on locomotives, being stationary, throw the light straight ahead, instead of throwing it so that it covers the track, where, course, the light should be all the time. The automatic headlight is suspended on two pivots, one on top and one on the bottom, so that it can swing freely. From the bottom of one headlight two chains Paul, the newest representative of the American Line. run to the ends of an arm which is connected by a rod has been made known far and wide through the colwheels strike a curve, the outside wheel forges slightly England, on January 15, for America, the ship was



BICYCLE WITH THOMPSON'S PROPELLING MECHANISM.



RAILWAY VELOCIPEDE WITH THOMPSON'S PROPELLING MECHANISM.

the effects of lost motion and drives the cranks on road accidents in 1895, about 875 were due to derail- life or property. The ship struck so gently that the ments, usually on curves. There is no doubt that a passengers were not awakened. speed or progress of the car or bicycle, that would certain percentage of these accidents could have been

avoided by the use of an automatic headlight.

tablishment of a telephone station on a wrecked ship. There was no loss of We have already fully described and illustrated the St. Paul. She appeared to be on her way to making some fine transatlantic records and may do so in the coming season. She is fitted throughout with the most elaborate improvements for comfort and safety. Her

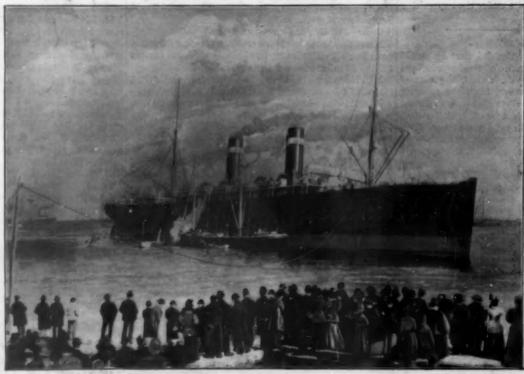
of January.

staterooms in their arrangement and size are a distinct advance on those of other ships, One excellent feature is the arrangement of rooms opening into each other, so that friends or members of the same party occupying rooms opening on adjoining corridors can open the door between them and have thorough ventilation all day.

Our illustrations show some of the most interesting features of a cabin on the St. Paul and St. Louis, the most novel being the air mat-tresses. If there is any place where a person requires every appliance for comfort it is in a ship's stateroom, and in supplying their new vessels with air mat-tresses the American Line has made a distinct advance over the old time practices. The air mattress presents the features of being always in condition, never wearing into and and



The news of the stranding of the steamship St.



THE STEAMSHIP ST. PAUL STRANDED OFF LONG BRANCH.

hollows; it is always cool and is the most cleanly type of bed that has ever been devised. All these qualities go to make it the acme of luxury in the sleeping way. By inflating to different degrees of softness any one's personal coefficient" is met.

The mattress consists of a sack of air-tight rubber cloth with the back and front stayed together in a number of places corresponding to the tufting of ordinary mattresses. The outer covering is of strong cotton duck heavily coated with rubber and vulcanized. To inflate it a foot bellows is supplied. Our cut shows the operation of inflating as in progress in one of the to the valve of the mattress by a long India rubber tube; a few strokes of the bellows inflates it, the tube although it has had many difficulties to contend with. is removed, the valve screwed down, and the mating for a year or more. Sometimes a mattress is

One important feature about air mattresses is that going quickly down hill. The principle of it consists they do not require making over. With hair mattresses this is a periodical necessity. For household use this feature is of value, and on ships using them by the hundred the stateroom stewards are saved much work by being exempted from the necessity of working over and beating into condition mattresses which get worn down and out of shape.

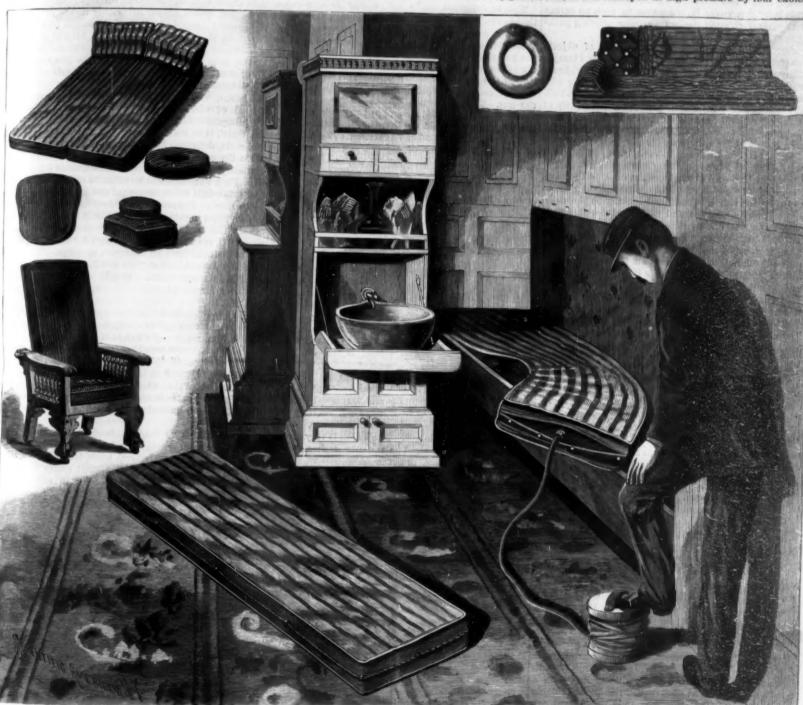
Trolley Road in Rome.

The new electric tramway which connects the main railway station of Rome with the center of the city is prican Line staterooms. The bellows is connected proving a great success as a means of rapid communication between the high and the low parts of the city,

The local authorities wisely refused to allow their trees is ready for use. It may not need another pump- principal streets to be desecrated by the poles and wires of an overhead system of traction; so the route

in short-circuiting the motors, which are then driven as dynamos by the momentum of the car, which is thus rapidly stopped. The cars weigh seven tons when empty, and when loaded their carrying capacity is stated as forty; but there are often more than fifty passengers on them. Their weight is about ten tons. They start every five minutes and take thirteen or fourteen minutes to perform the whole journey, the maximum speed allowed being nine miles an hour. The cars are well lit, and an elaborate system of electric bells enables each passenger from his seat to communicate with the motorman.

The motors are worked by current brought from the Electric Lighting Company, who possess the famous Tivoli-Rome transmission plant. At Tivoli, on the slope of the Sabine Hills, the power developed in large turbines is converted into electric energy by alternapumped up hard, and the occupant lying on it has the chosen was very difficult, on account of the steep gradi- tors, and is conveyed at high pressure by four cables



THE CABIN OF THE ST. PAUL-PERFECTION AIR MATTRESSES AND LIFE PRESERVERS.

air withdrawn until the exact pressure to suit his or ents encountered in several places, as well as some across the Campagna, a distance of eighteen miles, to her ideas is reached.

For marine use the mattresses are fitted with life lines, a single mattress being a life preserver, capable of sustaining as many people as can find room to grasp the lines. The same company supplies a neck collar, which is simply sprung around the neck, and which makes drowning an impossibility for the wearer. This collar goes on without any tying, its elasticity holding

without a pillow attached. Other cuts show double ing Company. Their address is 140 Pranklin Street, providing of an entire church with air pew cushions, making devotion in the old Puritantown more luxurious than would ever have accorded with the ideas of the Pilgrim fathers.

very sharp corners. It starts from the Piazza S. Silvestro and goes up the Via di Capo le Case and then through the Ludovisian Quarter to the Piazza di Termini. It consists of a double track nearly two miles the Havre tramways. Where telegraph and telephone wires cross the tramway, guard wires of steel are sus- to the trolley wire. pended to stop their fall and prevent them touching the trolley wire, if by any chance they broke. They did the overhead work and the equipment of the cars. One of our cuts shows this collar, and next to it are certainly not beautiful, but they are essential to mattresses designed for eamp use, one with and one the public safety. The trolley wire is supported by double bracket standards; where the track makes Boston, Mass. One of their recent achievements is the brakes are necessary. Both hand and foot brakes are used, one acting on the wheels directly and the other on the rails.

which will stop the car in a few yards, even when evergreen in most localities.

a transformer house just outside the Porta Pia, where the pressure is reduced before it is distributed to various subcenters in the city. As the current is alternating, it is transformed into continuous by means of long, and the general arrangements are the same as on high speed dynamo motors. It is then used to charge accumulators and give a constant 550 volt supply

-The Builder, London.

EVERGREEN privet (Ligustrum ovalifolium) thrives mattresses and pillows, hassocks, chair seats, and cushions, and give an idea only of the variety of goods to pull it out into the required curve, the wire coincidto pull it out into the required curve, the wire curve curve curve curve curve curv of this kind supplied by the Mechanical Manufacturing really with the sides of the inscribed polygon. In game, as well as for ornament in the mixed shrubbery some places the incline is over eight per cent, so special as bush plants. It has all but completely shut out the ordinary deciduous small-leaved forms, and to a certain extent, adds the Garden, the oblong evergreen forms. In some localities it loses its leaves only par-In addition there is an electric emergency brake, tially during winter. In ordinary winters it remains

Science Notes

Tea-Leaf Smoking.—According to Cassell's Saturday Magazine, it has become a fashionable distraction in England to smoke green tea in the form of cigarettes. A large number of the adepts of this new pastime, says the English journal, are highly educated women. A physician who has had occasion to treat patients for extreme pervousness and insomnia due to this practice states that among them there is a well known female writer whose novels are widely read and who habitually smokes from twenty to thirty tea cigarettes while working.

"At the home of a well known lady whom I am atresses who give tea smoking parties twice a week. A number of literary ladies at Kensington have formed a small club for the same purpose. One of my patients spends nearly two pounds a week to satisfy her mania. This habit, moreover, is spreading to such an extent that certain tobacco dealers are now offering packages of tea cigarettes to the public,"

Psychophotography.—That real images of objects are formed upon the human retina and persist tempomade by Mr. W. Ingles Rogers and described by him in the Amateur Photographer for November 22, 1895. Mr. Rogers took a shilling and looked at it intently in ordinary daylight for fully a minute, with the idea of fixing the image of it distinctly upon the retina. He then draw a yellow screen over the window of the room in which he sat, so as to exclude all actinic light, and, placing a photographic plate in a certain position, fixed his eyes upon the center of it, at the same time allowing nothing but the image of the coin to occupy his mind. He remained looking at the plate for forty-three minutes and afterward developed it, with the result that an outline of the coin was clearly shown upon it. The second experiment, made in the presence of three trustworthy witnesses whose testimony accompanies Mr. Rogers' communication, was still more remarkable in its result. In this case a postage stamp was substituted for the shilling. This was gazed at in a strong light for one minute. It was then removed and a plate put in its place and looked at for twenty minutes. The resulting psychogram," which is reproduced in the Amateur Photographer, lacked detail, but sufficient was shown to prove that the picture of an object impressed upon the retina can send out vibrations that will result in the production of an image upon a sensitized plate.

The Power of Gunz -One might be accused of ro maneing were be to as or that a gun is of several million horse power, and yet nothing is more exact, as we shall demonstrate. The Italian 100 ton gun (model of 1879), with a 550 pound charge of powder, throws a projectile weighing 2,020 pounds at an initial velocity of 1,715 feet per second. It communicates to it, therefore, a live power or kinetic force of 92,597,000 foot pounds. The thrust exerted by the gases due to the ignition of the powder lasts less than a hundredth of a second. The result is that during the active period of the work of the powder in the gun, the mean power is greater than 87 million foot pounds per hundredth of a second, say 8,700 million foot pounds per second. This represents a power of 19 million kilowatts or 17 million horse power.

There is unfortunately another side to this picture. Although large guns are extraordinarily powerful, their active life is essentially ephemeral, since, after a hundred shots, they are generally out of service. They have then worked actively one second!

The same calculation applied to modern guns that throw 2,200 pound projectiles, and communicate thereto an initial velocity of 1,970 feet a second, demonstrates, further, that such guns, during less than a handredth of a second each time, develop a formidable power of 18,050,000,000 foot pounds per second, say 94,000,000 horse power.

Taking Impressions of Plants.-The following simple method of taking impressions of plants is due to Mr. Bertot, of the French Academy of Sciences, A sheet of paper is first lightly oiled on one side, and then folded in four, so that the oil may filter through the pores, and the plant may not come into direct conpressed, through other paper, all over with the hand, south of Fulton Street and east of William. The book surface. Then it is taken out and placed carefully tor Place to Twenty-fifth Street, is stocked with many upon white paper, another sheet is placed above (as two impressions can be taken out at once) and the plant is pressed as before. Upon now removing it, an more than the assessed value of many a rural county invisible image remains on the paper. Over this is sprinkled powdered black lead, which causes the image to appear. With an assortment of pigments, the natural colors of plants may be reproduced. To obtain fixity, resin is mixed with the color in small quantity. The impression becomes fixed when it is exposed to a heat sufficient to melt the resin.

Prevention of the Freezing of Gas Pipes.-It has

carried along, and which, under the influence of the cold, is first condensed and then congealed, so as to obstruct the pipes. An attempt has been made to overcome this inconvenience by drying the gas through the action of concentrated sulphuric acid. But during the course of last winter it was found that, despite such precaution, there occurred numerous cases of freezing that had to be attributed to the congelation of the benzole. It, therefore, became necessary to seek another process which should prove efficacious in both cases at once. A process of this kind, recently patented by the Deutsche Continental Gas Gesellschaft, of Dessau, consists in injecting into the gas upon its exit tending," says he, "tea cigarettes are always passed from the gasometer a determinate quantity of vapor around after dinner, and I know three celebrated act- of alcohol. If, under the action of cold, the aqueous vapor and benzol condense, it will be the same with the alcohol, the introduction of which into the mixture will lower the point of congelation, and hence prevent the obstruction of the conduits.

The experiments made last winter demonstrated that the influence of the alcoholic vapor makes itself felt at a distance of two and a half miles from the gasometer. On the contrary, it disappears as soon as the gas passes through a wet meter. So the inventrarily seems to be proved by a series of experiments ors advise the installation of a small injector alongside of the meter in factories, railway stations, etc., in order to permit of adding alcoholic vapor anew to the gas. The proportion of alcohol necessary is 5 grammes of impure 95° alcohol to the cubic meter of the sale of manufactured goods. gas. In extremely cold weather the proportion of alcohol may be raised to 6 or 7 grammes. The addition ter, which is now almost wholly supplied by Denmark. of this small quantity of alcohol has no influence upon the calorific or illuminating power of the gas.

AN IMPROVED BICYCLE LAMP BRACKET.

The illustration represents a simple and durable



THE UNITED STATES DETACH- end, but may be readily ABLE LAMP BRACKET.

lamp bracket patented by James E. Bean, readily attached to and removed from a bicycle without disconnecting the lamp and the bracket. The improvement is being introduced by United States Manufacturing Company, Fond du Lac, Wis. In the illustration, B represents the bracket, which is held in place by a strong spring catch at its lower removed, leaving only the small elip, A, at-

tached under the axle nut. The catch is very strong, and may be made as tight as the user desires, so that it will never shake off or get loose.

Treasure Houses in New York.

"If the New York dry goods district should be destroyed to-night," said a business man to a representative of the Sun, "every great insurance company in the world would fail." Doubtless there is some exaggeration in such an opinion, but there are \$900,000,000 worth of insurable goods in the comparatively small down-town area known as the dry goods district, to say nothing of buildings, furniture, and fixtures. London and perhaps Paris are the only other cities in the world that equal New York as treasure houses of manufactured goods.

A single wholesale and retail house in the fashionable shopping district of Broadway contains \$11,000,000 worth of goods. Another house in Twenty-third Street contains \$6,000,000 worth. There must be scores of business houses containing from \$1,000,000 to \$5,000,000 worth of goods. The goods stored in three or four business districts would more than pay the national debt. The goods in the great clothing district run up into the hundreds of millions. The little jewelry district downtown is one of the richest urban areas in the world, Silverware, gold, and jewels valued at hundreds of millions are stored in the district centered about Union Square. The samples of a single hat house brought at auction in a recent year \$70,000. Some of the most tact with the liquid. The plant is placed between the precious articles in proportion to bulk are stored in the skins and hides, suitable for uppers, the suggestion is leaves of the second folding, and in this position is drug and chemical and perfumery houses in the region made that it might prove profitable if some large tanso as to cause a small quantity of oil to adhere to the publishing district, now stringing itself along from Asmillion dollars' worth of books. Single buildings with on manufactured leather being \$4 per kilogramme (22) their contents and the land they occupy are worth in this State.

New York Section of the American Chemical Society.

The regular monthly meeting of the Chemical Society will be held on Friday, February 7, at 8:30 P. M., in the chemical lecture room of the College of the City of New York. The usual informal dinner will precede been thought up to the present that the freezing of the meeting and will be at the Hotel Bartholdi, Broadgas pipes in winter is due solely to the aqueous vapor way and Twenty-third Street, at 6:30 o'clock.

American Trade in Venezuela,

If any appreciable increase in the imports from the United States into Venezuela is perceptible, it is simply due to recent and better facilities for the distribution of merchandise, and is confined to such articles as heretofore imported-flour, lard, hams, kerosene, "blended" butter, lumber, some kinds of hardware, common glassware, etc.; but the essential feature of our trade-the general introduction of our manufactured goods-is still wanting.

The stereotyped complaints about the independence of our manufacturers at first impels the belief that they do not want thi. Latin-American trade, but I am beginning odoubt the sincerity and validity of this criticism, invariably advanced by foreign merchants having their chief houses in Europe, and controlling nearly all branches of trade. If my suspicions are well founded, these statements are made to deceive the small native merchant and compel the purchase of such goods as it may be to the interest of the foreigner to further, whicu almost invariably means European. His present control of the market enables him to dictate both the place whence and the kind of goods he will import and sell, without regard to native taste, which, thus far, he has cultivated in one direction. Until some purely American houses are established in Venezuela, aided by a friendly native sympathy and sentiment, we cannot hope to make great inroads in

An important item of importation is fine table butand costs, delivered at Hamburg, about 30 cents, put up in tin cans of one-half pound and upward, hermetically sealed. I am convinced if some dairy near New York were to make an effort to secure part of this trade, it would prove successful and profitable. American butter as at present packed-with no view to its preservation in this climate—is justly in bad odor. To obtain the trade of an article of such universal consumption, is at least a good subject for investigation.

Until within three or four years, comparatively little cutlery was imported from the United States. Since then some improvement is visible, and it is within the power of our manufacturers to increase their sales in this line.

The largest native dealer in cutlery and hardware showed me through his warehouse, explaining the needs of the trade and wherein Germans, English, and Americans excelled, and expressed an earnest desire to make closer connections with American manufacturers, and his willingness to send them samples of various goods, believing that when once thoroughly acquainted with Venezuelan trade our people could obtain a greater share than they have at present secured. This opinion I fully share.

In brief, we have made a beginning in the sale of knives, forks, batchets, axes, hammers, and files (the latter preferred to all others), while crowbars, shovels, spades, hoes, seissors, etc., are almost exclusively pur-chased in England and Germany, in addition to everything bought in the United States.

The machete, of which tens of thousands are sold annually, are all bought in England. The machete is simply a very large and broad knife, slightly varying in size, but usually about 18 to 22 inches long and 2 to 3 inches broad, with which the Latin-American cannot dispense, and which he applies to more uses than one can conceive.

VENEZUELAN MANUFACTURES.

Venezuela is solely an agricultural country. Its factories are few, often of the crudest kind and devoted to the manufacture of the most pressing native wants, such as sole leather, soap, candles, matches, cigarettes, rum, native shoes (alpargatas), hats, and sugar.

The manufacture of sole leather seems to have acquired an impetus and support, for which its large consumption and the high duty thereon seems responsible. Puerto Cabello supports two tanneries, one electric, the other employing the usual improved methods. The output of the latter is about 27.800 pounds per week, with the prospect of the plant being enlarged and the output increased. French and English machinery is employed. I am not aware of any tannery in the country manufacturing uppers. As Venezuela exports large quantities of goat and deer nery in the United States would establish a branch in this country for this purpose, with American machinery and conducted on American principles. The duty pounds), and on the unmanufactured 50 cents per kilogramme, the poor people are practically debarred from its general use, and confine themselves, for ordinary wear, to the native alpargata, a modified scriptural sandal composed of a solid piece of sole leather, shaped for the foot, with a woven cotton upper, having an outlet for the big toe, a piece of similar material secured to the leather heel, and then passed over and fastened to the apper part of the heel of the foot.

The importation of sugar being prohibited, all large cane plantations have their sugar mills, with more or less advanced process 's for placing the product on the market, but no refinery exists in Venezuela, and all forest, coffee, cocoa, and copper districts in the repubsugar sold ranges from a very dark to a light brown.

Stap is made from native eccoanut oil, and candles are not only among the most profitable, but also of the greatest magnitude in Venezuela, the high duty giving them a monopoly in the common grade of these articles. Fancy and fine perfumed soap is not manufactured.

Rum and eigarettes are made from native products. the manufacture of the latter, together with considerable Cuban tobacco. Both industries seem to have reached a profitable base.

The alpargata (shoe) is manufactured, or rather put together, by numerous small factories, the woven cotton being usually purchased from the large factory in Valencia which makes a specialty of this article.

TARIFF.

The tariff of the country is divided into nine classes Duty is charged on the gross weight. A package of merchandise containing any article belonging to a higher class pays duty on the whole as of that class.

BANKING FACILITIES,

The want of banking facilities is often keenly felt. The two banks of Caracas and that of Maracaibo are the only institutions of the kind in the country, and with agencies limited as to the places and transactions, have, under prudent management, proved very profitable and beneficial to the business interests of the country. The want of such institutions in agricultural districts is generally recognized and deplored, and I can suggest no more profitable undertaking than one of this character, based on large capital and commercial standing. Large planters often require ready money to carry on their operations, and are compelled to resort either to the large merchant or usurer. In either case, he pays a rate of interest seldom less than 12 per cent, and not unusually 18 per cent per annum. If he deals with the former, he may be expected to purchase his supplies from him, paying a large profit on the sale. The planter's paper and collateral are unquestioned.

Often strangers with the best bills of credit find themselves remote from these legitimate institutions and are forced to submit to such a rate of exchange as the merchant may exact.

Attempts have, at various times, been made to obtain banking concessions, but always accompanied with such conditions as to make their denial necessary and imperative.

American capital invested in banks would be as safe and secure as at home. An American bank and American business houses are the only factors that will loosen the grip of European exporters.

FINANCE AND CURRENCY.

All values in this country are based on gold-gold of all nations being current as a commodity. Silver of other countries is forbidden circulation, but that of Venezuela is on a parity with its gold and is accepted in payment of all dues, public and private, without loss. This is due to the fact that, at present, no silver is coined and never has been, in excess of the government's ability to redeem it in gold. It is generally understood that were this limit of ability passed, the same conditions would exist here that prevail in all other South American republics, namely, silver would be at a large discount, and the poorer classes would suffer in the payment of their dues. Venezuela is, therefore, proud of the standing its silver coin has among the nations of the world.

The last Congress prohibited the emission of paper money by the government. The paper money in circulation is that of the banks at Caracas and Maracaibo, the only institutions authorized to issue paper money. For this money the government is in no wise responsible its acceptance not being compulsory, and it circulates only on the credit and integrity of the banks and in their own vicinity. Its issue is very limited.

INLAND TRANSPORTATION.

railroad. Now, not only are the ports of La Guayra goods used by them are confined to the most pressing and Puerto Cabello connected with Caracas by rail, but Barquisimeto and other places with the coast in like manner, while many railroad "concessions" for development of its best, but heretofore neglected, ter-

San Felipe will, at an early date, be connected with Puerto Cabello by a line of small steamers and a substantial "tramway," affording unprecedented facilities for exporting the products of that section of the country and distributing the imports, with a certainty, safety, and rapidity heretofore unattained.

the city of New York, has secured control of a Vene-zuelan concession to colonize and navigate the Yanguy cents per pound; sugar, 16 to 20 cents per pound; and medal given to Mr. Tunkey is of solid silver, weighs

lic. The mouth of the river is 12 miles from this port, and will be navigated for a distance of about 30 miles from stearin imported from Europe. Both industries and then connected with San Felipe (the storehouse and distributing point of that district) by a substantial trainway of about 25 miles. Being the only distinctive American enterprise in this district, other than the electric plant, I am happy to report that I believe this is an actuality and not a syndicate myth. The company has now three small steamers, with apparatus, Tollacco of excellent quality is grown and employed in at work clearing the river of obstructions. It is backed by well known New York capitalists.

MINERALS AND WOODS.

Tradition is that many rich gold and silver mines, worked both by the old Indians and Spaniards, exist in this consular district, not over 50 miles from Puerto Cabello. Fine and valuable specimens of both metals are constantly found, but no systematic efforts have heretofore been made to explore the country. Within the past three months, some of the American capitalists connected with the Yaracuy Navigation Company have sent out a number of New York mining engineers, who are at present prospecting the country. As they have not yet returned and no reports have been received, I am unable at this time to inform the department what success, if any, has attended their search.

This section of the country is noted for its productive copper mines. The Quebrada Company (English) operating those at Aroa have recently shut down mines and smelter owing to the great depression in the copper market. The quality of the ore produced is equaled by few mines in the world.

The Quebrada Railroad, built by the same company, for the purpose of transporting their product to the coast, is still in operation in conjunction with its leased lines-the Great Southwestern Railroad-connecting the large town of Barquisimeto with the coast of Tucacas (105 miles of road in all).

Phosphates, almost pure, are found near the coast, not far from this port, and only await a higher market and capital to develop.

The forests throughout the interior in this consular district consist mainly of hard, fancy cabinet woods, such as mahogany, ebony, lignum vitæ, cedar, green heart, etc., and will no doubt soon become an important item of export, in consequence of the operations of the Yaracuy Navigation Company.

PUERTO CABELLO.

The population of Puerto Cabello is now about 12,000, but as this is the largest port of entry in the country, next to La Guayra, the magnitude of its business cannot be measured by its population. On the other hand, it is one of the most metropolitan towns in the country and is an attractive place, comparatively speaking, containing four pretty parks and a theater, excellent water and waterworks, clean streets for a place without sewerage, pleasant dwellings, and handsome storehouses. Tracks are now being laid for a street tramway, with the object of transporting freight only from the warehouses of the merchants to the wharf, and not intended for passen-

The heat here is greatly tempered by the pleasant sea breezes that prevail during the day and evening and the mountain breezes at night, making the mornings and nights pleasant as a general thing throughout the year.

Puerto Cabello has the reputation of being an unhealthy place, and is so indicated in all encyclopedias. This possibly originated in an epidemic of yellow fever confined to some ships in the harbor about the year 1876, during which most of the ships lost nearly all their crews. The fever did not, however, spread to the town, and was brought here by these ships. Since then no epidemic or even an approach to one has appeared, either in town or harbor, and the uncorrected statement does gross injustice to the town. My own residence here enables me to contradict this generally accepted foreign opinion.

COST OF LIVING, WAGES, ETC.

The poorer classes of Venezuelans live mainly on Until some few years ago, Venezuela was without a fish and fruits. The few articles of manufactured wants and of the commonest grades,

Rent is exceedingly high. An ordinary pleasant dwelling costs from \$60 to \$80 per month, and what is the development of the remote interior seem to have termed a handsome house rents for from \$100 to \$120 be believed, Venezuela must soon enter upon a rapid be located in an undesirable, often in an unenviable, quarter of the town, and shabby both in exterior and more soap.-T. L. L. interior appearance. The luxury our poor enjoy in the way of small, neat, and cheap houses or apartments is unknown in this country.

Table board, with which a foreigner must be content, and to which the better class native is accustomed, The Yaracuy Navigation Company, chartered in the \$11 gold at the ports and often twice as much and River, a waterway running through one of the richest all other imported and native products in proportion.

Though this is an agricultural country, the native seems devoted to raising coffee, cocoa, and like products to the almost total neglect of good vegetables. Hence, we often see the peculiar spectacle of imported vegetables in a country that could with proper management export them.

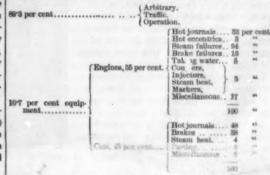
Incandescent light is furnished at very cheap rates. SAMUEL PROSKAUER, Consul.

Puerto Cabello, September, 1895.

Train Detentions.

At the December meeting of the New York Railroad Club the subject of the cause of train detentions was discussed. The discussion was opened by Mr. C. M. Mendenhall, of the Pennsylvania Railroad, who had compiled the following table:

CAUSES OF PASSENGER TRAIN DETENTION.



This, it will be observed, refers to passenger trains only, and Mr. Mendenhall explained that it does not represent all causes of detention, although we suppos it represents all cases of which he had records available. For example, under the head of Miscellaneous is a considerable group of detentions which could not well be classified, there being so few of them. He assumes one minute as the minimum delay; that is, he means by "late" within one minute of schedule time, and he believes that, if the records are carefully examined, it will be found that 84 per cent of passenger trains will arrive late at their destination. This, of course, will vary in different months of the year. The passenger schedules are generally so slow that more or less time lost can be made up, more in summer and less in winter. He was not able to give the relative number of detentions under the headings Arbitrary, Traffic and Operation, but the total of these three classes he has found to be about 80 d pur coul of all detentions. This leaves 10 7 per cent due to equip. ment, and of the equipment failures 55 per cent is due to engines and 45 per cent to cars. The further analysis of the causes is shown in the table.—Railroad Ga-

Typewriter Inks,

Take petrolatum of high boiling point, melt it on a water bath or slow fire, and incorporate by constant stirring as much lampblack or powdered dropblack as it will take up without becoming granular. If the fat remains in excess, the print is liable to have a greasy outline; if the color is in excess, the print will not be clear. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum, benzine, and rectified oil of turpentine, in which dissolve the fatty ink, introduced in small portions by constant agitation. The volatile solvents should be in such quantity that the fluid ink is of the consistence of fresh oil paint. Apply the ink, after agitation, by means of a soft brush, and rub it well into the interstices of the ribbon with a toothbrush. Hardly any ink should remain visible on the surface. For colored inks use Prussian blue, red lead, etc., and especially the aniline colors. For black try the following:

Aniline black	 16 oz.
Alcohol	 15 fl. og.
Glycerine	 15 fl. os.

Dissolve the aniline black in the alcohol, and add the glycerine. Ink as before.

TIPEWRITER COPTING INK. Glycerine..... Water... 13 fl. os.

Aniline dys..... Dissolve the soap in the water and glycerine, with acquired new life. If any of the many rumors are to per month. A house renting for \$30 per month would the aid of heat; dissolve the aniline in the alcohol, and

Gets a Medal for Speed.

Engineer William Tunkey, who pulled the Lake Shore's record-breaking train from Erie to Buffalo last October, has just been given an elaborate silver medal costs \$35 (United States gold) per month. Flour that by W. K. Vanderbilt and W. Seward Webb. Mr. sells for \$2.50 and \$3 per barrel at home costs \$10 to Tunkey's ability as an engineer saved this trial of speed from being a failure, for when the train reached State of New Jersey, with its main business office in more in the interior towns. Eggs are 40 to 60 cents per Eric it seemed irretrievably behind the scheduled time, learly two pounds, and is a work of art.

Harlem River to Forty-second Street, a distance of nearly five miles. This distance has for a long time been traversed partly through outs, partly through a tunuel and partly on a masonry viaduct. The upper part of Park Avenue, from 106th Street to the river, which is really a continuation of Fourth Avenue, is now being improved by the removal of the viaduct and cuts, and the substitution therefor of an elevated steel structure, on which four tracks will be car-The effect of this will be to throw open the street below to the public, leaving a width of 140 feet unobstructed except by the three rows of columns of the overhead structure. We have already illustrated the operation of the construction of this elevated way, which is now rapidly approaching completion.

A high level bridge is now almost completed over the river, which bridge is practically the largest railway drawbridge in the world and one of the very few four track structures in existence. Our illustrations show the present aspect of the improvements and of the bridge itself.

The viaduct is a steel structure carried on three rows of columns, each

being, of course, that the center girder sustains dou-The space beble the weight of the lateral ones. tween the girders is bridged over by New York Cen-

sists practically in a series of three-sided box girders covering the entire space, the longitudinal axis running across the structure. These act at once as roof, floor, truss and sleepers, and on them the rails will be laid. Drainage and leader pipes carry off the water, so that the street beneath the elevated way will be practically roofed over. This portion of the work is supplied by the Elmira Bridge Company, of Elmira, New York.

The small cut shows the full construction adopted on the viaduct. The high level bridge is the most impressive part of the improvements, and has the following general dimensions and features: On the north there are two bridge spans, the one farthest north being 181 feet 41/4 inches and

three trusses, one central and two lateral ones, the of rollers can be seen very clearly in the different cuts are rendered waterproof or protected by oil. The

center one being the heaviest. These trusses provide two clear ways across the bridge, each 26 feet wide, and in each of the trackways are two tracks. At the center the draw span is 64 feet high and at the ends 25 feet, all measurements being taken from center to center.

The 121 foot span weighs 475 tons and the 185 foot span 850 tons, while the great draw span weighs 2,500 tons. It is of the pinned truss construction, and some idea of its dimensions may be obtained from the fact that the principal top pin of the hip, next to the tower, is 11 inches in diameter, while the bottom pin of the center truss next the tower is 12 inches in diameter. These pins are all steam forgings, turned up to shape. Other dimenions are worth citation.

The bottom chord of the bridge, which chord has a double role to fill-acting at once as a truss member when the bridge is open and also as a girder between the success sive panel points, to support the weight of passing trains-is 48 inches deep. The tension members, extending from the top of the tower to the hips of the girders,

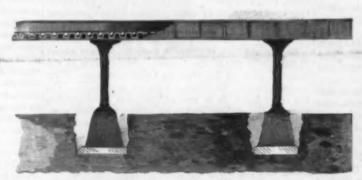
THE HARLEN RIVER DRAWBRIDGE AND THE PARK consist each of eight bars of steel 10 inches by 1% representing the bridge, especially in the one showing AVENUE IMPROVEMENT IN NEW YORK CITY. inches, representing in the aggregate a cross section the center bearing. Of course, only the outer drum. New York City possesses within its limits, on Man- of nearly a square foot of steel. One could easily go can be seen. The drums are stayed together by sixhattan Island, a single large railroad station, known through the whole structure and quote the dimenteen radial lattice struts, and the rollers, although as the Grand Central Depot. Into this depot the cars sions, but we are merely giving enough to afford an journaled, so that they appear to be wheels, really act of practically three lines of railroad run down from the idea of its great size. The floor of the bridge, which as true rollers in the operation of the bridge. On top



THE DRUMS ROLLERS AND GIRDERS UNDER DRAW SPAN HARLEM BRIDGE.

row supporting a longitudinal plate girder 7 feet 2 is carried directly by the bottom chords, is of the same are operated from the center tower by steam power. inches deep, % inch steel being used for the side and solid floor system as that used in the elevated way, the When closed the levers are drawn together so as to is for the center girders, the theory of construction troughs being 18 inches deep. The rails are laid di- take part of the weight of the ends, so that when rectly on this floor.

centric drums 4 feet apart, the outer one being 54 feet two through trusses and partly as two cantilever tral solid floor system of cross trussing, which con- in diameter, the inner one 46 feet in diameter. Under arms.



THE CONSTRUCTION OF THE ELEVATED WAY.

the next 185 feet 41/4 inches, these trusses being re- each of these drums is a circle of seventy-two cast them for courtesies received in connection with spectively 26 feet 3¼ inches and 30 feet 10¾ inches steel rollers turned to a perfectly true conical align- this article. high. The draw span, measured from center to cen- ment, the outer rollers being 24 inches in diameter. ter, has a length of 380 feet, its length over all being the inner ones 20% inches in diameter, and both being about 400 feet. Its breadth is 58 feet 6 inches from 10% inches face. The entire weight of the draw span center to center of the outside trusses, being carried by when open rests upon these 144 rollers. The outer circle

Of course, only the outer drum

of the drums is a series of eight steel beams, parallel and of varying length, representing chords of the circle of the drum, and on these beams the draw span, when open, is carried, so that there are provided thirty-two bearing points on the two drums, for this set of girders and for the draw span. All this is clearly shown in the view of the bridge and in the small view of the bearing. The drums are 6 feet high.

Merely to keep the bridge bearing in position, a center pivot easting is supplied, but the entire weight of the draw span, when open, comes upon the rollers. The center casting will have absolutely no work to do in earrying weight. The bridge is turned by steam, the engine house being situated above the tracks within the central tower of the structure. are installed two oscillating, double cylinder engines made by Edwards & Company, of New York. The cylinders are 10 inches in diameter and have 7 inches stroke.

The weight of the draw span is only partly taken up by the central bearings when it is closed. For each end there are levers arranged somewhat like toggle joints, which

the draw span is closed and the bridge is ready for The draw span of the bridge is carried on two con- the passage of trains the draw span acts partly as When the draw span is to be opened, the

levers are moved so as to give 3 inches clearance for the ends of the bridge. This is not all that is needed. The ends of the rails have also to be swung upward to clear the alignment chairs used to secure a perfect joint for the passage of trains.

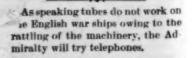
The reverse of these operations is carried out when the span is closed. A masonry structure is shown at the end of the viaduct, where it meets the bridge. This represents architecturally a stone abutment, but really it is of little utility, having been placed there almost entirely for architectural reasons.

The draw span rollers and approaches were built by the King Iron Bridge Manufacturing Company, of Cleveland and New York. Our thanks are due to

Waterproofing Brick and Sandstone.

A number of experiments were recently made to ascertain the length of time that brick and sandstone

three oils used were linseed oil, boiled linseed, and crude mineral oil. The amount of oil and water taken up by the sandstone was very much less than that absorbed by the brick, although the area of the sandstone cube was much greater. Equal amounts of the raw and boiled oil were absorbed. mineral oil, however, was taken up in much greater quantities by both brick and sandstone. By the end of twelve months the mineral oil evaporated from the bricks, but such was not the ease when the other oils were used. After an exposure of four years the bricks practically retained all their oil, inasmuch as they had not lost any of their weight, and were also nearly impervious to moisture. It was noticeable that the sandstone cubes treated with linseed oil returned to their original weights, but do not appear to have lost the beneficial effect of the oils, being also practically waterproof .- Mining and Scientific Press,





NEW ELEVATED ROADWAY ON PARK AVENUE AND PRESENT TEMPOPARY TRACK.

A Costly Patent.

One of the Paige typesetting machine patents, recently issued, "breaks the record" in the history of the patent business for the great bulk and complexity of the patent itself and the intricacy of the machine it It is said that over a million dollars was expended on the machine before the construction of the first one was completed. It has no less than 18,000 separate parts, and does the setting, justifying, and distributing of type in a way which would be satisfactory were it not for the cost and complexity of the machine. In the development of this invention Mark Twain is reported to have invested nearly \$250,000.

The first application filed for a patent on it contained 204 sheets of drawings, having over 1,000 separate views During the eight years the case was pending in the office before allowance, the number of sheets was reduced to 163. When it is remembered that the majority of patents have only a single sheet of drawings, and that to require as many as ten sheets is an exception. the magnitude of the invention can be understood. The fees charged by the Patent Office are uniform for all cases, no matter how complex or how simple-\$15 on filing the case and \$20 additional on allowance of the patent.

When this case was filed it was turned over to an examiner who received a salary of \$1,800, and he spent six weeks in studying the case before being able to take the first action. The entire specification was twice rewritten, each time by a different attorney. How much this cost the inventor is not known, but it is safe to say that the Patent Office lost heavily. It is estimated that it consumed about \$1,000 worth of the time of the various Patent Office officials before maturing into a patent, and when issued the usual rule had to be followed of preparing copies for sale at the regulation price.

The large number of sheets of drawings had to be photo-lithographed and the entire body of the specifications and claims set up in type, costing for the first edition, as estimated by the ordinary rules, a few cents over \$6 a copy. These copies were sold to the public at the usual price until the first edition was exhausted, when the Patent Office stopped the issue. A great many people ordered copies of this patent out of curiosity

A TRANSPORTED CALIFORNIA "GREAT TREE."

The accompanying illustration shows the great tree General Noble (named after General Noble, late Secretary of the Interior) as it now stands in the mall at Washington, D. C., between the Agricultural Department building and the Smithsonian Institution, which is shown in the distance. Among the multi-

and grandeur the great trees of California; no such trees are found in any other part of the world; they were first discovered in 1852 by a hunter, Mr. A. T. Boyd, and at once attracted general attention, and attained the widest celebrity. The genus, a species of redwood (Sequoia gigantea), was named in honor of Sequoia (pronounced Sequoyal), a Cherokee Indian of mixed blood. This specimen was 26 feet in diameter at base, 81 feet 6 inches in circumference and 300 feet in height, the section being taken about 20 feet from the ground; although considerably smaller than some others, it was found to be comparatively well preserved and symmetrical. It had to be hauled by teams of sixteen mules each, on heavy trucks built for the purpose, a distance of sixty miles on a rough mountain road; price paid for cutting, hauling and delivering on cars was \$7,500; section was divided into forty-six smaller sections, some of these pieces weighing over four tons; it took eleven cars to transport it to Chicago, where it was exhibited at the Exposition; total cost of hauling and installing at the Exposition was \$10,475.87; the additional expense of placing it in its present position would probably make a grand total of over \$12,000. As will be seen by plan, the interior diameter is about 13 feet, and average thickness about 20 inches; a circular iron staircase leads to platform about 18 feet above; it has been roofed over and shingled with round butt shingles painted red; four dormer windows light the interior. Our engraving was made from a photograph taken specially for the SCIENTIFIC AMERICAN.

A VENTILATOR FOR TELEPHONE CABINETS.

Telephone cabinets are so arranged as to smother that the conversation, which is to be carried on in a loud voice, shall not be heard outside, no provision is made for the least ventilation. It is well known how difficult it sometimes is in Paris to obtain communi-



MENIER'S VENTILATOR FOR TELEPHONE CABINETS.

cations, and it is a genuine punishment when it becomes necessary to remain ten minutes in one of these silk padded boxes.

We recognize the fact that the question is quite a delicate one; for, on the one hand, although for many reasons it is necessary to assure the ventilation of the cabinet, it is also indispensable to guarantee the secrets of conversation in an absolute manner, as it often has reference to important family or business matters in which those interested should alone take part. So we think it well to make known to those whom the question interests a simple and ingenious arrangement devised by Mr. H. Menier and applied for some months past in his offices.

In the top of the cabinet there is formed a wide aperture over which is placed a box open at the top tudinous marvels of nature, none surpass in majesty and bottom. In the latter are arranged, one above burying ground was found a vault-like chamber, faced

the other, a series of boards, of the same size as the box, resting upon ledges and covered with cloth. In sounds, as well as those who remain in them. In order the center of each of these there is a wide square aperture. Other and smaller boards, likewise covered with cloth, but supported by cords attached to the sides of the box, are interposed between the first. This obstructive arrangement gives the air a wide circulation, and, as proved by experience, completely annuls vibrations. In order to assure himself of this latter condition, Mr. Menier installed one of these apparatus over an aperture formed in a wall separating two rooms, and found that two persons standing at the distance of three feet on each side could not converse, even in a loud voice.

> This arrangement therefore completely solves, at slight expense, the double problem of ventilation and the smothering of sound.

> We are indebted to La Nature for the illustration and article.

Discoveries in South Russia.

Our Odessa correspondent tells us that the curator of the St. Petersburg Imperial Archmological Committee, Mr. Goshkevitch, has made some archæological discoveries along the banks of the Dnieper (Borysthenes) and the Bug (Hypanis). Opposite the village of Kisliakovka are the ruins of the ancient town of Olbia, described by Herodotus as surrounded by a wall with many towers, and distinguished for its extensive trade and its civilization. The ramparts and inner parts are well preserved, and terra cotta figures with subjects from domestic life, pottery, and small vessels are continually being discovered by the villagers. The number of ancient sites discovered by Mr. Gost kevitch is 15. Each is situated on the steep bank of the river, which forms a natural defense against surprise attacks, and the other three sides are surrounded by ramparts in a good state of preservation, with the ruins of dwelling places within the walls. At Propastnoe, on the edge of the ravine of the same name, many ancient Greek vessels were found, and both here and on the banks of the Bug were found pieces of money of the time of Emperor Theodosius the Great, who reigned near the end of the fourth century. In the village of Kisliakovka evident traces were discovered of an ancient Greek settlement, and the curator discovered a head of a statue. The peasants a short time ago unearthed a splendid Greek statue, but, being ignorant of its value, they destroyed it, although they sell to the first buyer the coins they find at the ancient site of Olbia, and many private persons in those parts have splendid numismatic collections of the Soythian and other periods,

In a tumulus near the well-known Borysthenian

with oak blocks, and a floor made white with cement or lime. A skeleton was lying on a stone slab with extended arm bones and on the wrist a bracelet of pure gold. Around the neck were four finely worked gold and amber necklaces, and at the hip bone was a kind of knife or sword. Thirty bone arrows in a quiver, as well as a cory tos or bow case, were near the skull, but the quiver crumbled away on exposure to the air. The skeleton crumbled to dust on being touched. Mr. Goshkevitch thinks it belongs to the Scythian period. In a ravine opening up into the valley of the Borysthenes (Dnieper) a considerable number of mammoth bones were discovered.

The curator has brought away to the Kherson Museum a massive piece of statuary having on its two sides crosses and cypress leaves, as well as a bunch of "prisob." This work is believed to belong to the period when the Genoese colonies were flourishing on the shores of the Black Sea. - London Times.

Elvind Astrup.

Elvind Astrup, who was Lieut. Peary's companion on his first trip across the inland ice, and who was with Mr. Peary on his second and xpeditions started days before Christmas for the purpose of making a ski excursion in the mountains of Norway. Three weeks having elapsed, his friends became alarmed and sent a party to search for him. Astrup was found frozen to death in the Lille Elvedal Valley, in the Dovrefjeld Mountains. He did excellent work when with Mr. Peary and gave great promise of being an independent Arctic explorer of note.



A CALIFORNIA "GREAT TREE" IN WASHINGTON.

Experiments on the Poisonous Action of Acetylene,

Thanks to the extreme kindness of M. Moissan, who has given me a sufficient amount of calcium carbide to prepare several hundred liters of acetylene, I have been able to make a series of comparative experiments, which I have the honor of presenting to the academy.

caused to be introduced into a mercury test glass, well dried, 400 grammes of carbide of calcium. A rubber cork pierced with two holes received a glass funnel with a cock in it and the other end a conducting tube, which carried the gas obtained by the flowing of water, through the glass retort, which allowed the regulation of the outflow; when all the air had been forced out, and when the gas obtained burned without explosion, the acetylene was received in a gasometer (model of Dr. Saint-Martin).

I successively titrated mixtures of acetylene, of air, and of oxygen, adding always 20 8 of oxygen as in the atmospheric air.

Mixture of 20 to 100.-I caused a dog to breathe a mixture composed of 20 to 100 of acetylene; the animal remained quiet; the respiratory movements became larger in extent. At the end of 85 minutes, 44 c. c. of arterial blood was injected into the empty receiver of the mercury pump, and I extracted the gas which had been collected over the mercury, in a little bell with a glass cock; after the absorption of the carbonic acid by potash, the gaseous residue was introduced into the fire damp indicator, whose receptacle had been filled with three quarts of air, and the gaseous mixture was contained in the receptacle and in the entire length of the graduated tube. At the first passage of the current, we saw a very clear blue same and a detonation was produced with a sharp sound; the reduction was equal to 824 divisions and indicated a considerable volume of acetylene, which had been absorbed by the blood; 1 c. c. of acetylene giving a reduction three times as large as that of carbonic oxide gives; that is to say, $3 \times 6.6 = 19.8$ degrees in my fire damp indicator; 100 c. c. of blood contained 10 c. c. of acetylene.

Mixture of 40 to 100.—The oxygen of Passy contains 90 to 100 of the pure oxygen. In order to obtain a mixture of acetylene of 40 to 100, the calculation indicated that it was necessary to add 55 liters of this gas, 66 liters of air, and 165 liters of oxygen, in order to prepare a mixture containing 79 of acetylene and 20 8 of oxygen. A dog who breathed this mixture, after having presented a long period of agitation, circulated in its lungs 112 liters of the mixture. Suddenly, 51 minutes after the commencement of the experiment, the animal extended its paws and died; the heart had stopped; we drew off the blood into the lower vena cava; it revealed in the fire damp indicator the presence of 20 c. c. of acetylene in 100 c. c. of blood.

Mixture of 79 to 100.-I made a mixture of acetylene and oxygen in which combustible gas replaced the nitrogen of the air. At the end, a dog caused to breathe this mixture presented a continual agitation and very ample respiratory movements. Eleven minntes afterward, we observed general convulsions; minutes after the commencement, he extended his paws, and there were some painful respiratory move ments, which preceded death.

This mixture of 79 to 100 was conducted into a bell formed glass jar in which there was a guinea pig. In 6 minutes the animal fell upon its flank; had convulsions, fluttering movements of the limbs and of the At the end of 30 minutes, we drew out the animal, which rested flat on its flank. Some minutes later the guinea pig raised itself and revived, but it died during the night.

I concluded from my experiments that the acetylene is poisonous when one employs a strong dose, if administered in large doses between 40 to 100 and 79 to 100. The employment of the fire damp indicator easily allowed the discovery of this gas in the blood.

I endeavored also to compare the poisonous quality of acetylene with that of illuminating gas. Starting from the fact often proved by analysis that coal gas (illuminating gas) contains 7 to 100 of carbonic oxide, I made a mixture of 150 liters of air, 5-3 of oxygen, and 20 liters of coal gas, which should contain 1 to 100 of carbonie oxide and 20.8 of oxygen. A dog forced to breathe this mixture presented at the end of 3 minutes violent movements of agitation. We took, 10 minutes encement of the experiment, blood from the carotid artery, and from 100 c. c. we could withdraw 27 c. c. of carbonic oxide. The dog when released remained lying on the floor-was very sick; and if the experiment had lasted some minutes more, it would have died. Illuminating gas is, therefore, much more poisoneus than acetylene.

Exposition at Montreal.

The British Empire Exposition and International Display of All Nations will be held in Montreal, Canada, from May 24 to October 12, 1896. The plans of the exposition include an electrical display, and the successful exhibitors will receive handsome awards.

*By M. N. Grehaut, in Compt. s Bendus.

Sorrespondence.

ELECTRIC IGNITERS FOR GAS ENGINES.

To the Editor of the SCIENTIFIC AMERICAN:

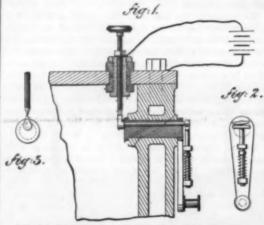
Allow me to call your attention to the fact that the rotary spark arrangement, Figs. 8 and 4, in an article on Electric Igniters for Gas Engines," by George M. Hopking, in your issue of January 11, is covered by my patent No. 546,238, of September 10, 1895, which particularly describes and claims the eccentrically bored FRANK S. MEAD.

Montreal, Canada.

[The several devices illustrated in the article referred to are based on the principle of the ordinary electric igniter used in connection with burners for illuminat ing gas. These illustrations were given merely as suggestions, leaving it to the reader to make the practical application. When this article was published the writer did not know that there was in existence a patent for a device similar to one shown in the article.

As Mr. Mead has called our attention to the similarity existing between his device and that of one of the illustrations, we reproduce some of the figures shown in his patent. This igniter is arranged to give a strong spark from a current derived from a battery, which insures the ignition of the explosive mixture at the proper time, and although no spark coil is shown in the circuit of the battery, we presume it was the intention to use a coil.

As shown in Fig. 1, the cylinder of a gas or oil engine is provided with the usual jacket, the end of the cylinder being closed by a cylinder head. In the cylinder wall is mounted a rock shaft connected at its outer end with a crank arm, as shown, or the shaft may be provided with a wheel receiving rotary motion from some revolving part of the engine. In the shaft is mounted eccentrically an electrode provided at its outer end with a cross bar on which presses the head



MEAD'S ELECTRIC IGNITER FOR GAS ENGINES.

on the end of the spring-pressed rod carried by the crank arm. On the end of the electrode within the cylinder is secured a pointed arm, as indicated in Fig. 8, adapted to engage the pointed end of a fixed electrode inserted in a sleeve held in the insulating bushings in the cylinder head. On the upper end of the electrode is secured a hand wheel to facilitate setting the point in proper position relative to the point of the arm of the movable electrode. A wire from an electric generator is connected with the adjustable electrode, and another wire from the generator is attached to some part of the cylinder.

It will be seen that when a rocking motion is given to the shaft by the crank arm, the spring-pressed head engages the cross bar, causing the movable electrode to move in line with the crank arm, and the oscillating electrode is moved into contact with the point of the fixed electrode, and by turning in its bearings in the shaft it finally passes the fixed electrode and produces the spark which ignites the explosive mixture in the cylinder. A similar result is obtained when a complete rotary motion is given to the shaft.

In the article to which reference has been made it was suggested that a small dynamo had been used successfully for producing the ignition. A correspondent has inquired as to the method of using a dynamo a lively agitation, and at the end of 6 minutes very for igniting the explosive mixture. The dynamo is driven by the engine, and its terminals are connected of 420 to 430 cubic meters; liquid acetylene, at 0 396 with the movable and fixed contact points. When the pound per horse power per hour, 108 tons, filling cylinpoints are separated, a spark is produced by the extra ders of an aggregate capacity of from 270 to 300 cubic or self-induced current of the dynamo. No coil is needed.-Ed.]

Call for a Motor Driven Sleigh.

To the Editor of the SCIENTIFIC AMERICAN:

We hear a good deal said about the horseless carriage. Why not take the sleigh in hand and move that with a similar motor? Such a sleigh would require the addition of a driving wheel back of the seat and midway between the two runners. This wheel would have a semi-free vertical movement and would be kept spring or springs above it. It would need to be light, tor purposes.

should have a polished surface, and should be rimless at edge, thus offering little, if any, chance for snow to adhere to it. At points around the margin of the wheel, two or three inches apart, little projecting spurs would give it the required hold upon the road to insure a forward movement to the vehicle. This wheel would get its motion from a crank or band connected with the oil or other motor, under the seat, as in the horseless carriage.

To guide our sleigh, a rudder-like fixture would be attached to the rear end of each runner, and the two would be moved, in concert, by the sleigh's occu-

A long brake, following the side of each runner, would have a roughened or lower surface, which would be brought to bear lengthwise upon the snow coating of the road by a bar, in the usual place, at the side of the carriage seat.

It seems to me the successful horseless sleigh is an easier problem to solve than that of the horseless carriage.

As to its rapidity of movement, it might easily outstrip the ordinary railroad train, if the road traveled would admit of it, or the occupant could bear the lively B. F. LEEDS. stirring up.

San Diego, Cal., December 6, 1895.

Care of Books,

Even to those who are most careful and particular with their loved and treasured libraries accidents will happen, and the human bookworm is at his or her wits' end to remove the difficulty, which threatens perhaps to ruin forever one or more of the choicest volumes

An English magazine lately published the following items, which will probably be found useful by any

To remove ink stains from books-A small quantity of oxalic acid, diluted with water, applied with a camel's hair pencil and blotted with blotting paper, will, with two applications, remove all traces of the

To remove grease spots-Lay powdered pipeclay each side of the spot and press with an iron as hot as the paper will bear without scorebing.

To remove iron mould-Apply first a solution of sulphuret of potash and afterward one of oxalic acid. The sulphuret acts on the iron.

To kill and prevent bookworms-Take one-half ounce of camphor, powdered like salt, one-half ounce bitter apple, mix well, and spread on the book shelves. Renew every six months.

To polish old bindings-Thoroughly clean the leather by rubbing with a piece of flannel; if the leather is broken, fill up the holes with a little paste; beat up the yelk of an egg and rub it well over the covers with a piece of sponge; polish it by passing a hot iron

Do not allow books to be very long in too warm a place; gas affects them very much, Russia leather in particular.

Do not let books get damp or they will soon mildew, and it is almost impossible to remove it.

Books with clasps or raised sides damage those near them on the shelves.-Inland Printer.

Calcie Carbide as Motor Fuel.

The Gas World quotes some interesting figures given by Dr. Adolph Frank, of Charlottenburg. in a paper communicated by him to a foreign contemporary, and recommending the direct use of calcium carbide in motors, the gas being liberated as required by means of water, and not carried about in a compressed state in cylinders. According to the authority quoted, both the Bitterfeld and the Neubausen works have improved their products up to 90 per cent yields, and, it is added, a price of 90s. a ton does not now look at all unlikely. The theoretical yield of acetylene is 26 pounds per 64 pounds of carbide, and the extra weight, that of the calcium, is a small matter in comparison with the expense and risk of fifty-atmosphere cylinders. Curiously enough, the liquefied acetylene obtainable from a given quantity of carbide occupies, as nearly as possible, twice the volume of the carbide itself.

The data arrived at are, for a 1,000 horse power marine engine, worked for 600 hours: Coal, at 1 54 pound per horse power per hour, 420 tons, occupying a space meters, and of sufficient strength to withstand a pressure of 50 atmospheres; carbide of calcium, 90 per cent or 36.56 per cent of acetylene by weight, total required. 300 tons, occupying 131 cubic meters only. In the last case the whole, which required protection from damp. etc., would not bring the space occupied up to 150 cubic meters. This (our contemporary remarks) is a very remarkable comparison in view of cases where storas capacity is all important, for the whole of the stead boilers would at the same time disappear; but, of course, in the meantime the price of carbide stands in close to the road's surface either by weighting or by a the way of the practical adoption of acetylene for mo-

This is the English name for the shell beads used for ornament and as currency among the northern tribes of ludians previous to the settlement of the country. were made chiefly on Long Island and around York Bay, and were of two kinds, one made of couch or periwinkle shells and the other of hard clam shells. The making of wampum, to be sold for ornaments, has been carried on for nearly a hundred years by the Campbell family at Pascack, N. J., and they bleach and soften the conch shells used in making claus shells that are made into the more valuable black or deep purple wampum. The conch shells are brought from West Indian ports by schooners. The clam shells are of the largest size obtainable, the smaller ones being too thin for the purpose.

The white wampum and hair pipes are, according to the New York Sun, made from the lip of the shell. which is cut into suitable sizes after being detached the body and put through a softening process that also bleaches it white. The hair pipes are somewhat thicker than a clay pipe stem, tapering from the center to both ends, and are graduated in length, by half inches, from one to six inches. They have a hole through the center lengthwise. They were used to ornament the long hair of the chiefs, which was run through the holes and secured with gaudy colored

Black or dark purple wampum has always been more costly than the white because it was worn only by the chiefs and medicine men and because of the difficulty of drilling the holes. But a small portion of a clam shell yields material of the proper hue, and when it is cut in sections there is so much waste by breakage that only the most expert workman can be intrusted with the task. The dark shell is cut in lengths like the white. A number of sections having been drilled, they were, according to the old process, strung on a wire and placed in alternating grooves running around a fine grindstone. As the stone revolved Rockaway sand and water were dropped on it and a piece of hard board was rubbed back and forth across the face, thus moving the wampum and rounding its outer surface. Then it was washed, dried, dipped in olive oil to give a gloss, and afterward made into strings for market. The clam shell could not be softened without ruining its color.

NEW ARMY BICYCLES.

The new army tandem and the model 40, mounted with a Colt's automatic machine gun, which have been made by the Pope Manufacturing Company, were exhibited at the Madison Square Garden Cycle Show and attracted great attention.

The tandem is one of the Pope Company's regular model 43s taken directly from stock and finished and forms hydrochloric acid, which, when the bat- Greek, Roman, Byzantine, and Arabian periods.

plainly in enamel and nickel. the front handle bars are tightly strapped two army overcoats, and on the rear bars a pair of blankets. Resting safely in brackets on either side of the machine is a twelve shot repeating rifle, and hanging on each seat post a Colt quick action revolver of the latest pattern. In addition to this there is a case of signal flags extending almost the whole length of the machine, but not interfering with the riders in the least; and this is the case with all the equipments, being as well and safely placed, ready for use in a moment, and yet causing not the slightest interference.

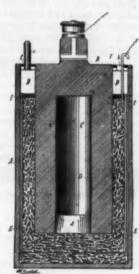
The Colt automatic gun mounted on the model 40 is the one recently adopted by the government for our navy. This gun weighs between thirty-nine and forty pounds, shoots two hundred and fifty or five hundred times-being automatically fed-and is remarkably accurate. It is fastened securely to the head of the machine, can be easily directed at any angle, and does not interfere with the rider or affect the steering of the machine.

These two wheels are as perfectly equipped with the necessary accouterments of war as would seem possible, which army people and civilians alike have shown in them leads one to believe that it will not be long before the wheel will form a very effective adjunct to regular army service.

It is proposed to construct a railroad from the city of Mexico to the harbor of Acapulco, on the Pacific coast. Acapulco has one of the finest lock harbors to be found anywhere, with 25 feet of water, and capable of floating all the navies in the world.

A NEW DRY BATTERY.

The battery represented herewith is said to be more durable than its congeners when not in operation, It consists of a glass vessel, A, in which is placed a carbon electrode, B, and a zinc one, E, which is closely applied to the inner surface of the vessel. In the carbon electrode there is a cavity, C, which may be filled with any kind of depolarizer and then be closed with a stopper, a. The space between the zinc and the carbon, as well as the lower part of the battery vesare now said to be the only persons who know how to sel, is filled with chopped rye straw, to which adheres bichloride of mercury, and which is quite strongly white wampum or to drill holes through the still harder compressed. This filling extends to within three-quarters of an inch or an inch and a half of the upper



NEW DRY BATTERY (VERTICAL SECTION.)

edge of the vessel, so that a space may be reserved for the reception of the liquid before the reaction is brought about. Upon the filling, moreover, there is placed a cap of hemp, f, designed to prevent the element from emptying when it chances to be inverted. The aperture of the glass, likewise, is closed with a cap of hemp, f, impregnated with a resinous substance, and to which is applied a coating of asphalt cement. Finally, three filling apertures are formed in the cover and are closed with stoppers, c.

After the liquid that is to dissolve the exciting salt of the battery has been introduced, the electric current produced decomposes the bichloride of mercury into chlorine and mercury. The latter amalgamates the zinc, and thereafter prevents it from being attacked when the battery is at rest. As for the chlorine, that combines with the hydrogen of the reaction

tery is not in operation, dissolves the layer of oxide of zine, and thus permits of a new attack of the positive electrode over its entire surface.

At rest, the element, however, remains perfectly dry, and so no reaction occurs, and it loses neither its electromotive force nor the force of its current. Thus is explained the longer duration of this new battery. La Vie Scientifique.

Egypt's History Traced from its Plants.

Dr. Schweinfurth made recently before the Egyptian Geographical Society, of Cairo, an address on the origin, or, more exactly, on the history, of cultivated plants in Egypt. He spoke in the first place on the route of the Hamitic race to the Nile valley, and concluded that they first lived in Northern Abyssinia and Southern Nubia as cattle breeders. From this point a nation of herdsmen could easily spread, and they certainly brought the ass with them from Somaliland and Nubia-an animal that had been used by man in Africa from prehistoric ages. The agriculture, literature, and religion of the ancient Egyptians were connected in the widest sense with the cultivation of plants. If all means of historical research are directed toward this subject, we find that of the 1,320 existing plant species of Egypt, of which 150 are useful plants, cultivated in great quantity, only 50 species of the latter were known before the Christian era, of which 40 are pictured on the monuments and the remaining 10 are mentioned in the inscriptions. If we would have a conception of the agriculture of the ancient Egyptians, we must exclude fully two-thirds of the plants cultivated in Egypt to-day. Dr. Schweinfurth distinguishes six epochs, according to the kinds of plants that were introduced into the country, as fol-

Epoch I .- Egypt is covered with grassy plains and forests, inhabited by the primitive African race, now extinct. Part of the cultivated plants belonged to the primitive flora of the Nile valley, whose representatives yet flourish over about 15° of latitude.

Epoch II.-Colonization of Egypt by the Hamitic ace. Disappearance of the forests, spread of the pastures, beginning of agriculture.

Epoch III.—Beginning of civilization; development of religion and art. Introduction of frankincense; acclimatization of the sacred trees of Arabia. Toward the end of this epoch the cereals were brought in from the Euphrates valley. Beginning of the cultivation of corn, barley, flax, and the vine.

Epoch IV.-Epoch par excellence of Egyptian agriculture. The three kingdoms and the Lybian-Ethiopian domination.

Epoch V.-Egyptian agriculture spreads to foreign lands and the land receives in return many useful plants from abroad. This epoch includes the Persian,

> Epoch VI.—Decay of Egyptian agriculture, about A. D. 1517. In the latter half of this epoch a regeneration followed and a return to civilization. By means of the Venetians the land received useful plants from America, such as maize, tomatoes, sweet potatoes, pimento, and tobacco. Tropical Africa gave it sesame, rice, sugar cane, and sorghum; Arabia, the sycamore, the fig. the pomegranate; Babylonia, cereals, speltz, corn, bariey, etc. . . and America again the most valuable of all her plants, namely, cotton.-Gaea, Leipsic.

Poisoning by Stale Eggs,

Dr. Cameron has reported the occurrence of vomiting and purging in seventy-four nuns and girl pupils in the boarding school attached to a convent in Limerick, following a dinner at which mutton and a custard composed of eggs, milk, corn flour, and sugar were eaten. The corn flour was suspected to contain arsenic, but analysis showed it to be free from poison of any kind, and to be of good quality. The sugar also proved to be pure. No other constituents of the meal could be obtained. The vomit and the stools were intensely green from the presence of biliary matter, but careful analysis failed to disclose the presence of ordinary poison. The viscera of two patients who had succumbed were also examined, but no poison was found. Ptomaines were found present. but in small quantity. The milk used had been boiled, and the meat was above suspicion. The eggs, however, were not fresh, and one presented a reddish-brown color and was thought to be bad. Some of the custard given to pigs induced severe diarrhea. --Dublin Medical Journal.



NEW ARMY BICYCLE MOUNTED WITH A COLT MACHINE GUN.



NEW ARMY TANDEM BICYCLE.

Discoveries in Pompeli.

The excavations at Pompeii are a continual source of interest. The new system of conservation inaugurated this year makes them doubly important. The last mansion unearthed in the buried city, whose history every one now knows so well (or ought to know), has been made the test of these improved methods instituted by the able and excellent directors. Instead of hiding away the statues, pictures, and other movable objects in the Naples Museum, as has previously been the custom, everything has been left in situ, and many objects sufficiently restored to give an idea of their original appearance. The excavation may be said to have begun in August of 1894; but the weather and lack of funds retarded the work. In November the atrium was reached; but during the winter the work progressed slowly, and the last rooms were not unearthed till June, 1895, the labors of restoration, cleaning, and preservation not being completed till August, exactly a year from the date when the first layer of earth was removed. The main entrance of the house leads into a street still blocked up with rapilli; it consists of an ostium, or passage, on one side of which sat the janitor, his little division being separated by a partition of wood that has disappeared. Facing his seat is a semi-"religious" picture, only suitable to that barbarous period of Europe's history, and which has now very properly been covered over. There were two great doors in this passage. On the outer wall of the house can be seen the remains of the iron hinge and staple that held the bar across the outer door when the house was locked up and the family had deserted it.

The room on the left of the ostium contains two small and ordinary pictures of the stereotyped kind: one represents Leander swimming across the Hellespont to Hero; the other Perseus in his ship deserting On the opposite wall is a picture of Ariadne. Cephaius and his devoted wife Procris, in the form of a wounded deer, the latter being probably also represented by the woman high in the left of the same painting gazing earnestly at her husband. These pictures are let into the wall, and the prepared stucco on which they were painted was probably first laid on a board, to afford greater facility to the artist, and then, when it had dried, was inserted in the space prepared for it in the stucco on the wall's surface; the brown, yellow, or sometimes black band of paint that usually borders them hides the joining line. In the suppose, Vesta; at their feet is the tutelary genius in frieze is seen Leda and the swan, a bacchant with a the form of a serpent, which is the symbol of regenerthyrsus and a bacchante with a tamboureen, while two ation, or of new life, accepting the offering of fruit of attention.

centaurs appear on the tops of this delicate painting. The garlands painted on the white wall, the architectural studies capped with winged sphinxes, and the cornices of red, white, and blue mouldings above and below the frieze, and separating it from the curve of the arched ceiling, add immensely to the appearance of the colors; and this elaborately painted apartment is the more attractive by the amount of brilliant red cinnabar that has been used in its decoration, and that adds considerably to the splendor of the effect.

Beyond this room, at the side of the atrium, is a side passage leading through the kitchen into the little street named by Fiorelli the Vicolo di Mercurio; in it is a staircase. Near its entrance in the atrium are the remnants of a safe, once built and riveted on a foundation of heavy stones. The iron parts are original, but the case of wood on which they are fastened is modern. Near this safe were found a bronze ring and two seals, both of iron, which are preserved in the house of the Administration of Pompeii preparatory to going to the Naples or the local museum. On one of the latter is A. VETTL RES. V.," and from this the house is to be called the "Casa di Vetti." On the opposite side of the atrium is another and larger safe, likewise restor-Both safes bear evidence of having been broken ed. to pieces either by those who had dug their way down into the house, or perhaps by thieves under cover of darkness on the very night itself of the destruction of the city, when the mountain's awakened "voice at intervals" was heard roaring "through those roofless halls," and

Temple and tower went down and left a site : Chaos of ruins !

A delicate little gold chain, with pearls and a few coins, besides a bronze seal with the name "P. CRVSTL FAVSTI," were found in the highest level of earth over the rooms on the right of the atrium; but these objects may have belonged to the owner of another house, and not to the proprietor of the safes. Close to the larger of these latter is the entrance to an irregular shaped room, that contains a lararium, or altar. It stands out from the wall about eight inches, and on its sides rise two columns; between them, painted on the back of the niche sunk in the wall, is the usual picture of the two Penates or genii, and a female between them who represents either the Lar or, as some

placed before him on a small altar. The colors are wonderfully fresh, the tints are principally red, brown and vellow.

When the garden in the marble-decked peristylium is again green with shrubs, and its beds continually stocked with gay and sweet-scented flowers, the mansion will assume (except in its protecting roofs) an aspect as if the inhabitants had only just deserted it, and the earthquake had only lately taken place.-H. P. Fritzgerald Marriott, in the English Illustrated Magazine.

A Lighthouse at Cape Hatteras.

Work on the Diamond Shoal lighthouse, off Cape Hatteras, is to be begun next spring. The new plans contemplate an immense structure, built on the screw pile order, with the foundation of the light practically 100 feet beneath the wave surface and protected on all sides by hundreds of tons of riprap to prevent damage from shifting sands. Iron piles will be driven down by hydraulic pressure until a sound footing is secured, and the actual structure for the lightkeepers and materials to maintain the light will be built on the interior of the skeleton to a height of 165 feet above the water. The cost of the structure when completed is estimated at \$1,200,000, and of this sum there is now available \$400,000. Diamond Shoal projects into the sea seven miles off Hatteras, and is covered with from 6 to 20 feet of water. It is marked now only by Hatteras light, standing on shore seven miles from the outer edge, and not discernible in hazy or foggy weather. The proposed light will be on the extreme edge, seven miles from the nearest shore, and visible twenty-three nautical miles. The latest fog apparatus will be provided, and there will be accommodation for three keepers. It will probably take two years to complete the project from the date the work begins. When completed it will be the most notable lighthouse in the world.—Army and Navy Journal.

THE Lancet announces that a subscription has been opened in Bristol to provide for the purchase and retention in that city of the celebrated collection of relics belonging to Jenner in connection with his introduction of vaccination. The collection is at present the property of Mr. Frederick Nockler, of Wottonunder-Edge, and was exhibited by him at the Bristol Exhibition in 1898, and since then in London, at each of which places it attracted a considerable amount

RECENTLY PATENTED INVENTIONS Railway Appliances.

CAR FEEDER.-Charles A. L. du Ques may, New Orleans, La. A frame secured to the front end of a car carries an inclined pivoted netted fender, the fender being curved apward at its rear end to form a proteeting pillow. A spring-controlled front strand of the fender is adapted to yield inwardly, when a person is caught in the path of the moving car, and when one falls on the fender it is tilted and its front end raised to lift the fact from the ground, the head and shoulders being scied by the pillow.

CAR BRAKE. - George E. Wheeler, Minneapolis, Minn. This is a brake more especially adapted for use on street care, requiring but little effort on the part of the motorman or gripman, and not inter. fering with the ordinary brake, which may be left on the car for use in case of accident. The comprises a fixed and a loosely mounted bevel faced conjugates a know and wheel on the axle in proximity to each other, and both adapted to be engaged by a conical friction wheel on a shaft connected with a hand lever extending apward

CAR OR VEHICLE DRAUGHT DEVICE. James H. Turbush, New York City. This improvement provides conveniently attachable supports for the inward and outward thrust of the drawbars, the supports being rigid and constituting travelers upon which the followers may have movement, while relieving the confining strap or the for the springs from the strain they ordinarily on

CAR DOOR .- Thomas W. Bradman and Harrison Hines, Beardstown, Ill. This is a sliding exterior freight car door, on the upper part of which are hangurs adapted to usove apon a track, and the door is adapted to be locked in closed position by means of three bolts actuated from a central disk, the bolts being moved outward into suitable keepers at the top and two sides of the door by a crank, when a seal finger may be conveniently applied. The door is easily opened and closed, and is designed to afford effective a to property in cars on which it is employed.

RAILWAY RAIL NUT LOCK. - Green Smith, Montgomery, West Va. This device has a base plate that may be extended or adjusted longituding oring its bolt spertures into alignment with the rail and field plate sperture, a raichet washer having a recessed outer face receiving the adjacent face of the nut to be The ratchet washers having nut receiving recesses, the improvement may be applied to any noits and nuts now in use on railroads, or the ratchet teeth may be formed directly on the nats where they are to be sup-

Miscellaneous,

BICYCLE -Samuel A. Donnelly, Chicago, IR. This is an improvement on a formerly pater tion of the same inventor, and the box or casing for lug and opposite inturned lip receiving and engaging the lip of the other part. An improved diamond frame also has upper and lower bifurcated truss members, each formed of a single rod doubled at its middle, the head having arms with sockets to receive the doubled ends of the members, while the saddle block, at the angle of the upper member, has angular grooves to receive the mem-ber, there being straight transverse stay rods whose upper ends enter sockets in the block, and a bolt which aps the block to the parts in contact with it.

PROPULSION OF VESSELS.-James H. Mescham, Petersburg, Va. An endless band propeller, patented by this inventor, comprises sprocket wheels at some distance apart on each side of the vessel, the sprocket chains or bands of steel, copper, or other metal with suitable tenacity and flexibility, carrying the backets or paddles. To avoid undue strain upon the bands, the wheels are polygonal, but are rounded instead of presenting true angles, and the paddles may be feathere

VENDING MACHINE. - Charles W. Goldamith, New York City. This is a coin-controlled apparatus especially adapted for delivering bulky packages, and has two pairs of oppositely arranged supports movable toward and from each other, and capable of supporting alternately crossed elongated packages, each pair of supports alternately dropping a single package for de-The coinway is of the usual constructi livery. ot be inserted when the merchandise has been

DENTAL FILLINGS.-James W. Dennis, Cincinnati, Ohio. An absorbent of mercury during the process of filling teeth with amalgam has been provided by this inventor, consisting of rubber saturated with comminuted metal having an affinity for amalgam, the material thus formed being apertured, whereby a maxi num of metallic surface will be presented to the amaigum filling. The material may be made into pads or plugs of a size or shape to enter a tooth cavity, and thus facilitate making non-shrinkable metallic fillings by ab-

LOCK.-Lewis O. Wilson, Charleston, West Va. This is an improvement in knob locks, providing a lock more easily applied to doors by simply boring a hole instead of mortising in its edge, the lo capable of being unlocked only from the inside. The lock has a slotted cylindrical barrel in which he a spring-acting boit with a hole, in which he arranged a retracting bar whose end extends into a slot in a frame plate on outside of the door. A knob shaft with crank also receives the end of the retracting bar.

PHOTOGRAPH PRINTING FRAMES. Allen E. Willis, Oxford, N. C. An automatic register for keeping tally of the number of prints in the frame has been devised by this inventor, the improvement per-mitting the examining of prints without disturbing the nitting the examining of prints with register and the proper setting of the register in or nt is spelled. A toothed bar is mounted to slide in deways on the print-holding back, a pawl engaging print is spelled.

HAME FASTENER.-Joel P. McAhee, Erie, Ala. A connecting bar pivotally o

one of the hame sections, according to this improvement, has a latch extension and head, while a keeper pivotally eted with the opposing section has receive the latch extension and a locking device improvement is especially adapted for hames having iron bands, the fastening device facilitating the connecting of the two members of the hames at the bottom around the collar and the necessary adjusts size of collar.

SLEIGH BRAKE. - Adelbert Mecham, Edinburg, North Dakota. This is an improvement on a formerly patented invention of the same inventor, pro-viding means whereby the brakes may be strengthened and the drag bar readily lifted from the ground when it is necessary to back the sleigh. A brake bar is em-ployed for each runner, terminating in a shoe as wide and strong as desired, and the brakes are automatically applied when the team backs, as in going down hill, the aking engagement being removed when the team pulle rwardly. In going up hill the drag bar enters the sur-

Hose Nozzle.-John M. and Albert W. Dosch, Kittanning, Pa. This neggle is forked, one of the members carrying an adjustable yoke in which is a cone, there being a three-way cock in the nozzle at the junction of its members, the nozzle being adapted for either garden or fire purposes, and providing for bringing into action instantly either a solid or a spray stream.

The spray is thrown out in conical form, covering a large area, and may be conveniently made either o

POCKET KNIFE.-William Schmachtenerg, New York City. This is a knife in which the blades may be opened without using the finger nails, a lever fulcrumed inside the handle engaging the knife blade near its fulcrum end to swing the blade to partly open position, and this lever being moved by the sh of a button on the outside of the handle. There similar lever for each binde in opposite sides of the adle, a spring in the back of the knife holding the blade open or closed as usual.

SELF-CLOSING LACING HOOK. -LA ROY S. Upton, Governor's Island, N. Y. This is an article hook is composed of two parts, a fixed base seated in the leather and having at one side a vertical arm or hook, another movable part being a lower swinging arm nivoted to the base arm and normally closing the open ide of the book. By drawing the string outwardly laterally against the movable arm it is opened and the string disengaged, while by passing the string laterally between the open arms and drawing it taut, its re-engagement is autom atically effected.

Designs.

SCARF RACK.—Homer E. Eyman, Lan-

TABLE CLOTH FASTENER. - Theodore Desjardins, Attleborough, Mass. This is a

piece with scalloped shell-like top portion and two spring side and bottom members for holding a table cloth in position on a table.

INSCRIPTION PLATE.-Edward K Jones, Portland, Oregon. This is a plate to be applied to aidewalks at street corners, to receive street names, advertisements, etc., the plate having a straight back edge and a wave-like curved front edge.

Note.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date

NEW BOOKS AND PUBLICATIONS.

BMENTS OF MODERN CHEMISTRY.
By Charles Adolphe Wurtz, Fifth
American edition. Revised and enlarged by Wm. H. Greene, M.D., and
Harry F. Keller, Ph.S. (Strasburg).
With portrait of the author and numerous illustrations. Philadelphia
and London: J. B. Lippincott Company. 1895. Pp. 808. Price \$2.50.

Wurtz's modern chemistry is so well known and en joys so wide a popularity that it really requires no review Sixteen years ago the first translation was given to the American public by one of the editors of the present work. The book is now thoroughly re-edited and presents a very acceptable treatise on the science, including, we are glad to see, both argon and hel

PRACTICAL PROOFS OF CHEMICAL LAWS A Course of Experiments upon the Combining Proportions of the Chemical Elements. By Vaughan Cornish. London and New York: Longmans, Green & Company. 1895. Pp. xii, 92. Price 75 cents. No index.

It is an open question how far the study of chemistry can be treated inductively. It certainly seems that the student has a right to accept the work of the world of chemists, and that he should not be obliged to obtain for himself proof of many known chemical laws. But this little manual really gives an inductive treatment of a small portion of chemistry, only enough to show how the laws can be and have been proved. We note in the preface that the work has been done by pupils from welve to eighteen years of age, spending one and a half hours at a time in the laboratory, with two weekly at We certainly think the amount of inductive research given in this manual could properly and advantageously be performed by all chemical students. The

AMERICAN ANNUAL OF PHOTOGRAPHY
AND PHOTOGRAPHIC TIMES ALMANAC FOR 1896. Edited by Walter
E. Woodbury. New York: Scovill
& Adams Company. Pp. 870. Price
75 cents.

There can be no question but that this annual has come to occupy a leading position among publications of its character in the United States. The volume for 1896

is replete with two hundred illustrations, many of which aluctions of the best work by prominent amateur solonal photographers. There are articles on and pro and productions of photography to science, such as a pho-tographic record of sound analysis by Professor William tographic record of sound analysis by Protessor which Hallock astronomical photography and photogrammetry and telephotography by Albert Gleaves of the U.S. A., and descriptions, with illustrations, of many useful places of apparatus, besides an abundance of the latest formulas for developers and lenses. It is a book of much value tograp: to the photographer desirons of keeping up with the

THE WONDERS OF MODERN MECHANISM.
A Resumé of Recent Progress in Mechanical, Physical and Engineering Science. By Charles Henry Cochrane. Philadelphia: J. B. Lippincut Company. 1896. Pp. 402. Price 32. No index. No index.

In this work we find presented in popular form the In this work we must present any popular form the achievements of engineers in the many departments of science, such as building, manufacture of steel, elec-tricity, artificial refrigerating and similar topics. Naturally, the subject is treated somewhat superficially, and per-haps for that reason is all the better adapted for the readers it is desired to reach. It is quite profusely illustrated and in many ways is really notable as being thoroughly up to date. Whatever serious value it has would have been immensely enhanced by an index.

The Scientific African.-The Scientific African is the name of a new journal, the first copy of which has just been received. Phonetically it might easily be confounded with the SCIENTIFIC AMERICAN, but the resemblance really ends there. Still this paper gives of a very useful existence as an expone South African science and technology. It is published monthly at Cape Town, Africa. The industries of South Africa are daily increasing in number and importance, and the new journal is pledged to foster these industries by illustrating and describing the various methods now in use, so us to increase the number and improve the quality of African manufactures. In addition to this, pure science is not to be neglected, as is seen by the notes on natural history, geology, anthropology, medi-cine and chemistry which appear in the first number. We welcome it to the brotherhood of scientific iour

SCIENTIFIC AMERICAN BUILDING EDITION

JANUARY, 1896.-(No. 123.)

TABLE OF CONTENTS.

- 1. A residence at Orange, N. J. Two perspective elevations and floor plans, also an interior view. Approximate cost \$12,000. Mr. Frank W. Beall, Chicago, Ill., architect. An imposing design, and one appropriate to the location,
- A Colonial residence, at Springfield, Mass., recently erected for Mr. W. S. Scott. Two perspective elevations and floor plans. Cost \$6,000 complete, Architect, Mr. G. W. Taylor, Boston, Mass. An artistic design.
- A residence recently erected for Rev. S. E. Smith, at Corcoran Manor, Mount Vernon, N. Y. Perspec-Perspective elevation and floor plans. Cost \$7,500 complete. Mr. A. M. Jenks, Mount Vernon, N. Y., architect. An attractive design.
- 4. A dwelling at Hasbrouck Heights, N. J. Perspective elevation and floor plans. Cost complete \$3,500. S. A. Dennis, Arlington, N. J., architect, A modern and attractive design.
- 5. Two perspective elevations and floor plans of a country house, at Lawrence Park, Bronxville, N. Y., recently erected at a cost of \$10,000 com Mr. Wm. A. Bates, New York tect. One of the most artistic and picturesqu country houses in Westchester County.
- 6. Public school No. 9, of Erie, Pa., recently erected at cost of \$38,000 complete. Mr. Joseph Frank, Eric, Pa., architect. The design combines a striking exterior appearance and a convenient interior
- A half-timbered cottage of moderate cost recently erected at Gien Ridge, N. J. Architect, Mr. E. R. Tilton, New York City. A pleasing design.
- A view of the Washington Arch, New York City.
 Designed by Mr. Stanford White, of the architectural firm of Mossre. McKim, Mead & White, New York City.
- 9. View of the new Surety Building, New York City. Total height from curbatone to coping, 314 feet, being the loftiest inhabited building in the world.
- 10. Miscellaneous Contents: A great bell.—Calvert Vaux The world's tallest structures. - Powerful dredge for the Mississippi River.—The centenary of the Institute of France.—A new corner grate, illustrated,—The "American Trackless" sliding door hanger.—The Handeo "straight flush" closet, illustrated.—A simple and efficient pump, illustrated. wood,—Artificial fuel,—Ancient glass makers - House numbering, -- Fires in "sky scrapers,"-Non-heat conducting coverings, illus makers - House ed. - Improved wood-working machinery, Illus-

The Scientific American Building Edition is issued outhly, \$2.50 a year. Single copies, 25 cents. two large quarto pages, forming a large and splendid Magazine op Anchitecture, richly adorned with elegant plates and fine engravings, illustrating the most ng examples of Modern Architectural Construc tion and ailied subjects.

ess. Richness. Cheapness, and Convenience

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Adver-tisements must be received at publication oftes as early as Thurming morning to appear on the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

"C. 8." metal polish. Indianapolis. Samples free

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. Screw machines, milling macrines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Use the Hough Security Cash Recorder. Entirely dif-ferent from a Cash Register. Hough Cash Recorder Co., Springfield, Mass.

For Sale—75 H. P. engine, 16" x 30", a in good order. Can be seen running. Will be sold low.
Address A. P. W. Paper Company, Albany, N. Y.

"History of Cripple Creek."

We have just issued in book form the only authentic and reliable history of Cripple Creek gold camp, the marvel of the mining world. The book contains numerical. ous full page illustrations of gold mines true to life.
With the sole object of introducing our big 8 page 86 column illustrated weekly paper (established 1800) we will
send a copy of the above interesting book free to all who nd us 25c. (stamps or silver) for a 3 months' (13 weeks' trial subscription to our big weekly, which contains the latest mining news and illustrations of Bocky Mountain scenery. Club of 5 and 5 books. \$1. Mention the SCIENery. Club of 5 and 5 books. \$1. Mention the SCIEN-C AMERICAN, and address Illustrated Weekly, Den-

The best book for electricians and beginners in elec-tricity is "Experimental Science," by Geo. M. Hopkins. By mail. \$4; Munn & Co., publishers, 301 Broadway, N. Y.

Whereas, the copartnership heretofore existing in the City and State of New York between Orson D. Munn and Alfred F. Heach, under the copartnership name of Munn & Co., and baving its principal place of business at No. 351 Broadway, in the City and State of New York, has been dissolved by the death of Alfred E. Beach on January 1, 1896; and

, the said copartnership had business rela tions with foreign countries and transacted business in the State of New York for a period of five years and up

ward; and Whereas, I, Orson D. Munn, the surviving copartner, am desirous to continue the business conducted by the said copartnership and to continue the use of the name of Munn & Co.

Now, I, Orson D. Munn, do hereby certify and declare that I am the person dealing under such name of Munn & Co., and that my place of abode is 14 East Twenty-second Street, City of Now York, and that my principal ss is at No. 361 Broadway, in the City and State of New York.

(Signed) Onson D. MUNN. [L.

A. A. HOPKINS.

City and County of New York, ss: On this 6th day of January, in the year 1866, before me personally came Orson D. Munn, to me known to be the individual described in and who executed the force instrument and acknowledged to me that he execute same for the purposes therein mentioned.

(Signed) A. A. HOPKDS.

Notary Public,

Kings County, New York. Certificate filed in New York County.

IW Send for new and complete catalogue of Scientific nd other Books for sale by Munn & Co., 361 Broadway New York. Free on appli



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question. In uiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

houses manufacturing or carrying the same.

Special Written Information on matters of
personal rather than general interest cannot be

personal rather than general interest cannot be expected without reminieration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of

Minerals sent for examination should be distinctly marked or labeled.

(6711) F. W. B. asks for directions for making an over-ready pad for rubber stamps: A. The following is said to be a cushion that will give color per-It consists of a box filled with an elastic composition, saturated with a suitable color. The cush-ion fulfills its purpose for years without being renewed, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. The composition consists preferably of 1 part gelatine, 1 part nent cloth cover. water, 6 parts glycerine, and 6 parts coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts black, or a solitable quantity of logwood extract, to parts of glycorine, part absolute alcohol, 2 parts water, 1 part follows: Dissolve in 2 oz. of pure water 120 grn. of red prossing soap, 1-5 part sallcylic acid. For red, blue or prossing of potash (potassium ferrocyanide), and seep-Venetian soap, 1-5 part salicylic acid. For red, bine or violet, 1 part gelatine glue, 2 parts aniline of desired color, I part absolute alcohol, 10 parts glycerine, I part Venetian soap, and 1-5 part salicylic acid. The following are two additional receipts used for this purpose:

1. Mix and dissolve 2 to 4 drm. aniline violet, 15 os, alc. MIX and desorve 2 to 4 cress, annue violes, 15 oz, al-cohol, 15 oz, glycerine. The solution is poured on the embion and rabbed in with a brush. The general method of preparing the pad is to swell the gelatine with cold water, then boil and add the glycerine, etc.

this work have won for it the Langer Choulation any Architectural Publication in the world. Sold by hewsdealers.

MUNN & CO., PUBLISHERS,

351 Broadway, New York.

(6712) F. W. writes: 1 Would have gus plant arranged on the principle of the one described on page 8 arranged on the principle of the one described on page 8. (6712) F. W. writes: I would like to

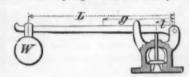
How large would generator bottle and receiver have to be to supply two jets that have been used for coal gas (ordinary dwelling house size). Can acctylene gas be used in such fatures? A. You cannot use ordinary burners for acctylene. Use $\frac{1}{2}$ foot burners. A 1 cubic foot gasholder and a 2 quart generating jar will supply them nicely. It is well to have separate inlet and outlet pipes for the holder. 2. Are the chemicals employed very corrosivo? Can iron or brass connections and stopcocks be used where flexibility is not essential? A. Use ordinary fittings, avoiding brass and copper. 3. Where can calcium carbide be obtained (that is, where could I get a small amount of it)? A. Address Eimer & Amend, 305 Third Avenue, New York, N. Y. 4. Is there any more danger of explosion in acetylene gas than in coal gas?

(6713) G. H. DeL. asks: 1. On a 500 volt street railway circuit, how much current does any one car take at full load? A. At 50 horse power 75 ammuch current does any peres could be taken. 2. I have a small bipolar shuttle armature motor, capable of driving a twelve inch fan with six small cells of plunge battery. Is there any possible way of altering the winding so as to have it act as a small generator producing enough current to light one or more miniature incandescent lights of 1, 2, 3, etc., candle power. Could you refer me to some SUPPLEMENT describing a small dynamo? A. You will have probably very lit-tle satisfaction in making the change, unless the field is of cast iron, so as to possess residual magnetism. For small dynamos we refer you to our SUPPLEMENT, Nos. 161, 599, 600, and 844. No. 599 describes a drum armature, much the best, for No. 161. 3. Having the voltage as perage given, how can the resistance be found? perage and resistance to find the voltage? And the re-sistance and voltage to find the amperage? A. Let C=

amperes, E=volts and R=ohms. Then C= E=CR; R= $\frac{E}{C}$. 4. What is fastest rate of speed ever

attained by a locomotive in the United States? A. We refer you for items on recent railway speeds to the Scientific American, vol. 68, No. 20; vol. 72, No. 22; vol.

(6714) R. N. T. says: Will you give me formulas for computing the elements of a safety valve



A. Let W = the weight.

L = distance between center of weight and fulcrun in inches.

Let w = weight of lever in pounds.

Let g = distance between center of gravity of lever and fulcrum in inches.

Let 1 = distance between center of valve and fulcrum

in inches.

Let V = weight of valve and spindle,

Let A = area of valve in square inches. Cet P = pressure at which the valve is to blow off, per square inch.

Then the weight required to balance a given pressur at any given distance on the lever will be by the for

$$W = \left\{ \text{ (P \times A)--} \left(\text{ V +} \frac{(w \times g)}{1} \right) \right\} \times \frac{1}{L}$$

When the weight is at hand and known, and the dis ance is required, then

$$\mathbf{L} = \left\{ (P \times \mathbf{A}) - \left(\nabla + \frac{(\mathbf{w} \times \mathbf{g})}{1} \right) \right\} \times \frac{1}{\mathbf{w}}$$

The elements between the brackets to be computed st. To obtain the area of the valve, multiply the square of the diameter by 0.7854.

(6715) D. P. D. says: Please let me know, through the Schentiffe American, how to put a 14 in. hole through a heavy glass bar? A. This can be done with a hard drill and spirits of turpentine—a te-dious and uncertain process, and only for small holes. A diamond drill is much better and cheaper, if there are many holes to drill. If large holes are wanted, from 1/4 in, to 1 in, or larger, prepare a piece of thin tubing of brass or copper, of the required size of hole, of 1 or 2 in. in length, with small spindle and grooved pulley attached, something after the style of the watch maker's now drill. Fasten upon the plate of glass, at the point to be drilled, a ring of metal or wood for a guide to keep the tubular drill in its place, until the cut is started sufficiently to steady the cutter. Lay the glass plate horizontally, and work the drill perpendicularly with the bow, using one hand to steady the upper end of the drill stock, Feed emery (about No. 90) and water into the open end of the tube as fast as required. In a very abort tin will cut a disk out of the plate. Another plan is to heat the drill to a low cherry red and plunge in a solution of chloride of zinc (soldering fluid). This gives the drill an exceedingly hard edge; grinding removes the hard por-tion. Therefore, the drill must be hardened after grinding.

(6716) C. J. M. asks how to make leaf photographs. A. Pass the paper first through a solution of gelarin, 1 part in 20 parts of hot water, and use a strong solution of potassium bichromate; or the gelatin and bichromate may be used together. Wash with hot water. A strong blue blackground may be produced a rately 140 grn, double citrate of iron and ammonium in 2 oz. of water; mix the solutions, filter, float the paper for a few minutes on the filtrate; print from the dried paper as before, and wash thoroughly in water. By adding a little phosphoric acid to the bichromate solution and exposing the print before washing to the vapor of a hot solution of aniline in alcohol, a blackish-green or red positive is obtained. Or, prepare the paper with solution of iron sesquichioride, and develop after exposure with a very dilute solution of sliver nitrate. Use plain th a very dilute solution of sliver nitrate. Use plain cotographic paper.

(6717) G. D. H. says: Can you give memple rules for calculating the speed of pulleys? A. Cutter. See Cheese cutter. Download cutter. Dark room, F. A. Wattenberg.

The diameter of the driven being given, to find its number of revoluti

Rule.-Multiply the diameter of the driver by its num ber of revolutions and divide the product by the diameter of the driven; the quotient will be the number of

revolutions of the driven Ex.-Twenty-four in. diameter of driver × 150, num = 300.

The diameter and revolutions of the driver be given, to find the diameter of the driven, that shall make any given number of revolutions in the same time

Rule.—Multiply the diameter of the driver by its num-ber of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter

Ex.-Diameter of driver (as before) 24 in. × revolutions 150 = 3,000. Number of revolutions of driven required = 300. Then 3,600 + 800 = 13 in.

The rules following are bht changes of the same, and will readily understood from the foregoing examples: To ascertain the size of the driver

Rule.-Multiply the diameter of the driven by the num ber of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver.

To ascertain the size of pulleys for given speed. Rule.—Multiply all the diameters of the drivers to gether and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of the main shaft.

TO INVENTORS.

An experience of nearly fifty sears, and the prepara of more than one bundred thousand applications for tenus at home and abroad, enable us to understand laws and practice on both continents, and to possess equaled facilities for procuring patents everywhere synopsis of the patent laws of the United States and foreign countries may be had on application, and per contemplating the securing of patents, either at home abroad, are invited to write to this office for principles of the patents of the contemplating the securing of patents, either at home abroad, are invited to write to this office for principles of the patents. Add MUNN & CO, office Scientific American, as in man, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 28, 1896,

AND EACH BEARING THAT DATE.

(See note at end of list about copies of these patents.)

	Advertising apparatus, J. H. Scott 553,569
X	Advertising apparatus, J. H. Scott
	Advertising device, M. H. Richardson
2	Air and gae mixing machine, H. S. Duces
d	Air beater, H. G. Dohrman
n	Alarm. See Low water alarm.
•	Armature for electric machines, H. M. Garanes
	Atomizer, powder, A. C. Bancr
	Axies, roller bearing for ranway car, V. N.
×	Boucher. 558,773 Bag bolder, F. Goff. 568,752 Baling press, F. L. Robison 558,560
	Barrol charuing or discharging apparetts E
×	Friedman
r	Klinger 553,909
	Basins, combination supply and waste fixture for wash, J. Totham
	Battery. See Electric battery. Secondary bat-
	tery. Bearing, antifriction, A. H. McMaster. 553,666 Bearing, ball, Meyer & Carrer. 653,568 Bedstead fastening, J. T. Wakkins. 553,768 Bedstead fastening, J. T. Wakkins. 553,668 Belt stretcher, G. M. Parapsau. 551,668 Bleyele babit, H. W. Rood. 553,668 Bleyele babit, H. W. Rood. 553,668 Bleyele babit, H. W. Rood. 553,668 Bleyele pub. self-culling, O. Krauss. 553,668 Bleyele peda; F. D. Owen Balley. 553,686 Bleyele peda; T. D. Owen Balley. 553,685 Bleyele peda foe city, A. A. Balley. 553,685 Bleyele seat back support, W. E. Frail. 553,722 Bln. See Floor bin. 563,722
þ	Bearing, bail, Meyer & Carrer
	Bell, bicycle, H. S. Pullman
	Bicycle habit, H. W. Rood
	Bicycle nuls, self-oling, O. Kraus 200, 521 Bicycle, military, T. V. Handloser 553,655 Bicycle pedal, F. D. Owen 553,685
d	Bicycle pedal, F. D. Owen
е	Bicycle seat back support, W. E. Prail 563,722
	Bloomers, T. H. Royce
9	Bloomers, T. H. Royce
0	Boiler. See Hot water or steam boiler. Marine boiler. Steam boiler.
3	Book cover, C. L'Enfant
	Bottle, G. W. Upton
Ļ	Bottle, G. W. Upton 558,601 Bottle Billing device, J. Iredaie 553,754 Bottle, non-Bilable, H. G. Woud 552,551 Rottle, stopper, safety, L. Luddau 553,651 Bottle, depoper, safety, L. Luddau 553,651
ľ	Rottle stopper, safety, L. Landau
	Ricycle pedal, F. D. Owen. Ricycle pedal to etip. A. A. Balley. So. 683 Bicycle seat back support. W. E. Frail. Bio. See Flour bin. Biomora, T. H. Royce. Blowpipe, T. B. Walmsley. So. 682,789 Book namifold sales. Bee Hot water or steam boiler. Marine boiler. Book cover, C. L. Furfant. So. 682,599 Book manifold sales. J. Bengough. So. 683,993 Bottle, G. W. Upton. So. 683,993 Bottle, G. W. Upton. So. 683,993 Bottle, G. W. Upton. So. 683,593 Bottle, non-fillable, H. G. Wood. So. 553,693 Brake. See Air brake. Burlon. Burlon. So. 687,793 Burner. Soe Fuel burne. Button, collar, F. A. Wattenberg. So. 686,794 Hutton feed mechanism. W. E. Bennett. So. 867 Can See Oil can. Cane mill, C. A. Calvert. So. 683,793 Car coupling, J. S. Boyd. So. 585,595 Can. Car coupling, P. C. Ewart. So. 687 Car coupling, P. C. Ewart. So. 687,794 Car door, J. R. Silmons. So. 583,792 Car fender, L. Hachenberg. So. 584, 595 Car fender, L. Hachenberg. So. 585, 595 Car fender, C. M. Willox. Car
	Bustle, shoulder, T. P. Taylor
	Button, collar, F. A. Wattenberg. 566,744 Button feed mechanism. W. E. Bonnett 563,803 Calipers, L. C. Reisner 563,605
	Calipers, L. C. Reisner 563,505
1	Cane mill, C. A. Calvert 553,607
ŀ	Car coupling, J. S. Boyd
	Car coupling, J. M. Larkin. 568,587 Car drop door, J. B. Simons. 568,792 Car fender, M. F. Flynn. 588,592
١	Car fender, L. Hachenberg, 553,522
	Car fender, J. B Kendail
	Car fender, C. M. Wilcox. 553,549 Car fender, street, H. L. Bedford. 558,664
	Car, band, A. Hitt
	Car lubricator, coal, G. Maurer
	Car pilot, railway, E. P. McKais 503,757 Car replacer, Heretrom & Grandjean 553,818
	tion of railway, E. Langen
	Jackson
	Cars, electrical propulsion for street or other, J. Jackson. Lard punching machine, Jacquard, H. Hardwick, 552,752 Cardboard, adjustable cutter for cutting, C. W. Hobbs. Carding engine feeding mechanism, F. A. Fiasher 253,671 Carpet sweeper, A. D. & A. B. Linn. Carriage iron, F. B. Carr. Carriage iron, F. B. Carr. Carrier. See Cash and package carrier. Cash and package carrier. S53,682 Carriare and package carrier. S53,682
	Hobbs. 553,528
1	Carpet sweeper, A. D. & A. B. Linn
j	Carrier. See Cash and package carrier.
1	Cash and package carrier, Weaver & Barr 553,548 Cash check holder and cutter, A. D. Josha 553,620
1	Casting, production of moulding and core sand
1	Chain, lock, P. S. Kingaland
l	Cheese cutter, N. J. Smith
I	Carriage ton, F. S. Carr
J	De Camp
1	Cigarette machine, W. C. Briggs 568,507
1	Cleaner. See Dish cleaner.
	Cooker coffee, W. B. Labouster
1	Copying device, E. Terrell
	Correct class Protector J. C. Gilton Sex 353,611
ĺ	Cotton gin, mw, J. Rice
	Cotton gin, maw, J. Rice. MALMY Coupling. See Car coupling. Crucible, C. Capper Mall Coupling. M

94	
Dentist's cap crown slitter, J. B. Monfort 553, Dentist's cap crown slitter, J. B. Monfort 553, Dentist's cap crown slitter, J. B. Monfort 553, Desk, school, C. B. Towie 550, Dish cleaner, C. T. Gug 550, Dish cleaner, C. T. Gug 550, Dish cleaner, C. T. Gug 550, Dish cleaner, J. S. Hoyt 550, Dish cleaner, J. S. Lord 550, Dish cleaner, J. S. Lord 550, Dish cleaner, J. C. Faggn, J. L. George, 550, Electric m.t.rs. control system for, G. Sautter ct sl. School 550, Dish cleaner, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, 550, Electric switch, J. C. Faggn, J. L. George, J. L. George, J. K. S. State, J. C. Faggn, J. L. George, J. C. George, J. L. George, J. L. George, J. S. George, J. L. George, J. L. George, J. L. George, J. S. George, J. L. George, J. J. Dull (P. J. George, J. J. J. George, J. L. George, J. J. J. George, J. J. J. George, J. S. George, J. S. George, J. K. S. Geor	6127 6127 6143 6584 668 6777 672 672 672 672 672 672 672 672 67
Generator. See Steam generator. Generator. See Steam generator. Glass press, A. Kaul. Gold from its ores, process of and apparatus for extracting, Pelatan & Cieriot. Gun, spring air, W. P. Markham. Hanger. See Shaft hanger. Harvester, corn, G. E. McV ay. Harvester, corn, C. S. Waters. Harvester, corn, C. S. Waters. Hat fastener, E. Meyer. Heater. See Air heater. Feedwater beater. Hofsting and conveying machine, A. H. De Camp 563,77 Hook. See Sanp hook. Horpes tail guard, P. Von Lackum. SSA,57 Horseshoos, panching machine for making nail- Boids ic. W. J. Kens. Horseshoos, panching machine for making nail- Boids ic. W. J. Kens. SSA,57 Horseshoos, panching machine for making nail- Boids ic. W. J. Kens. SSA,57 Horseshoos, panching continued by the see Sa,57 Horseshoot, See Sa,57 Horsesho	644441
Joint. See Dol. Joint. Jus houser, A. P. Woodard. Key, T. Douabue. Key, T. Douabue	0273524033258 B4555 440
Mazen safe, Ball & Bowen Mechantoni movresent, L. C. & U. G. Gillett. Mill. See Cathe cull. Mill. See Cathe cull. Mill. See Cathe cull. Miller Membro. Moston, means for changing, J. J. Hamilton. Moston, Membro. Moston, M. Decling. Musical Instrument, S. Merrill. Musical Instrument, S. Merrill. Moston, J. C. McCarshy Oli clan, J. C. McCarshy Oli clan, J. True. Oli clans, J. True. Signature and true an	A RESERVE OF REAL PROPERTY.
Bost Corruption and cleaning machine, T. E. Hoffman, F. Walt. Pedal, spring, R. P. Walt. Pedal, spring, R. P. Walt. Plano actions, J. R. Perry. Sisk, 507 Pleture, transparent transfer, E. E. Pile. Sisk, 507 Pleture, transparent transfer, E. E. Pile. Sisk, 507 Pleture, transparent transfer, E. E. Pile. Sisk, 507 Pleture, C. B. Composition, J. P. Burnham. Sisk, 608 Placer machine, H. A. Walker. Planter, corn, G. W. Campbell. Sisk, 707 Planter, corn, G. W. Campbell. Sisk, 707 Planter, potato, J. Joseop. Sisk, 608 Plow, ridins, C. S. Rust Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Power transmitting rods, support for, J. Bly. Sisk, 608 Sisk,	BBBBBBBBCCC CCCCAGLIMM
Ballway conduit, electric, A. Beck. 585,502 Railway, electric, M. L. Wood. 585,709 Railway gate, automatic, G. A. Reynolds. 585,709 Railway gate, automatic, G. A. Reynolds. 585,709 Railway spite, C. Platz. 585,602 Railway spite, C. Platz. 585,602 Railway system, A. H. Lighthall. 585,602 Railway system, a R. L. Lighthall. 585,705 Railway, sustem, a R. L. Lighthall. 585,602 Railway, sustem, a R. L. Lighthall. 585,602 Railway, sustematic coal recording system for, F. A. Walters. 586,602 Railway, sustematic coal recording system for, F. A. Walters. 586,602 Railway, sustematic coal recording system for, R. Walters. 586,602 Railway, sustematic coal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sustematic soal recording system for, R. Walters. 586,602 Railway, sust	M NNO P
Recipromating drift, A. E. W. Mchasser 508,508	Pi Pi Pi Ridi
Scythe, C. Fredrickson. Scaling iars, etc. device for. A. Scullter	W WW
Shaft, rotains, C. G. De Lavel. 553,678 Shaft, rotains, C. Hankin. 553,431 Shafting collar, J. Hankin. 553,431 Shafting collar, J. Hankin. 553,431 Shafting collar machine, L. C. Hopkins 556,735 Shindle collar machine, L. C. Hopkins 556,735 Shindle collary signal. 556,348 Skirni. See Rallwy signal. 556,348 Skirni. 556,568 Skirni communicate, M. Skirbter 556,568	Or TO STORY

	Heientitic	
-	Stan Book, W. G. Tower Scap bolding attachment, A. E. C. Gilmour Speed indicator, J. Rogginger Son Symming frames asidie, J. M. Parker Soluting frames, differential motion for driving bobbins of, M. Campbell pole socket, S. S. Sbeaffer soluting machine, J. Patleschits 583.79	S140 000
B 75 / 20 / 20 / 20 / 20 / 20 / 20 / 20 / 2	soap holding attachment. A. E. C. Gilmour. 558,75 (asp holding attachment. A. E. C. Gilmour. 558,75 (asp holding attachment. A. E. C. Gilmour. 558,75 (asp holding frame as delle. J. M. Parker. 568,75 (asp holding frame as delle. J. M. Parker. 568,75 (asp holding frame, differential motion for driving bobbins of, M. Campbell. 558,76 (asp holding frame).	E I
100 00 00 00 00 00	greet sweeper, A. Hankey	200
	urgical instruments, etc., steriliser for, E. M. Lundbolm. 688,461 Lundbolm. 688,461 witch. See Electric switch	-
HAM HAM	cesta, artificial, A. L. & B. F. Gilmer. 555,355 cleagraph repeater. B. F. Marritt. 555,555 cleagraphic and telephonic transmission, composite, B. E. Backus. 553,055 clephone antiseptic diaphragm. E. Wescheke. 553,055 ine recorder, workman's, W. L. Bundy. 553,754 ire, pneumatic, F. H. Perry. 553,754 ire, wheel, Thuston & Gill. 556,055 ires, mending punctures in pneumatic, J. W. 555,555	
THE PER	ire, wheel, Thuston & Gill 555,592 trees, mending punctures in pneumatic, J. W. 555,592 Mix 555,592 tree, valve for pneumatic, S. L. Sears 555,791 obacco ordering apparatus, J. K. Proctor 555,791 oogs, Quino & Bradley 565,792 ool, combination, J. Frye 565,797 oothpick, H. Falkenstein 565,610 rack structure. V. Anneres 552,771 accounty, aerial, J. H. Dickinson 555,771	J
TTTTTTT	ool, combination, J. Frye	
T TERT	ookhpick, H. Falkenstein	
TTT	ps casting machine, G. H. Ziesler. 555,558 psewriting machine, J. M. Fairfield. 555,538 psewriting machine indicator device, J. M. Fairfield. 565,538 prella ribs, machine for forming connections for C. F. Wurster. 565,603	
U PERF	mbrella ribs, machine for making tip caps for, C. F. Wurster	
V	bicle gran, G. D. Scott. 553,682 bicle spring, G. T. Glover. 553,568 locipede hub, T. V. Handloser. 553,566 byding mechine, newnanger W. R. & J. S. Nor-	
WW	seels, coating water bottoms of, A. McDougail 555,647 aistband, H. Green	
WWWW	Cooleg	
WWWWW	Cooley asteriors papersus, 565,769 steb bow fastener, Muck 565,569 steb bow fastener, Muck 565,569 ster closet seat, H. Runney 568,769 ster closet seat, H. B. Riggs 568,769 sheel, Ree See Fifth wheel 568,769 sheel, Di Vecchio & Coward sheel but board, duplicate L. C. Thompson 563,761 indow or door screen, H. M. D. Strader 563,769 ster fastener, R. E. Curties 563,761 rod, impregnating, A. D. Tyler, Jr. 563,678 ringer, See Mop wringer, ke, nuck, H. P. Kidney 568,784	-
	the state of the s	
	DESIGNS.	
A:	tle box frame, W. S. Adams	9 0

Axle box frame, W. S. Adams Buckle frame, C. B. Harris	25,094
Buckle, suspender, J. Forsheim.	25,093
Button, E. G. Nikiaus. Buttons, box plate for cuff, E. D. Guild	25,000
Casket plate, M. Bremer	25,096
Clasp loop, garment, F. A. Ives.	25,001
Fireplace front, Fairbairn & Brah	25,107
Hammock, I. E. Palmer	25,000
Laundry fron, W. A. E. Henrict	25,105
Metal bo., H. Macarthy	25,097
Pan, meat. Mabee & Zetzsche Sewing machine cabinet, G. W. Longstaff	25,104
Stove base, L. Kabn	25,108
Tile, C. C. Alexander	
Trimming knife, E. S. Harris Truck side bar, W. S. Adams	
Valves, casing for siphon discharge, H. P. Cope	26,100
Vehicle step shank, H. C. Swan	25,103

TRADE MARKS. dar, Chapman & Smith Company.....

Baking powder, Chapman & Smith Company Beer, J. Koehler. Bicycles, King B Cycle Company. Bicycles and their parts. Hamilton Cycle Com-	27,000
pany, Bicycles for women, King B Cycle Company. Bicycles, guns, and pistols, M. E Johnson. Braids, Rothschild Brothers & Company. Canned fresh beef, J. Baiz. Canned fruits and vegetable, F. P. Hendley. Car buffers, pistforms, and couplings, and parts	27,088 27,088 27,088 27,087
thereof, Gould Coupler Company Cider mills, P. P. Mast & Company and Superior Drill Company	27,725
Cigars, G. W. Whitney. Confectionery, Wright & Moody. Cotton fabrics. Naumkeag Steam Cotton Company Flour, wheat W. A. Coomba.	27,604
Frour, wheat, W. A. Coomba. Gum, chewing, J. P. Primier. Lamps, electric, New York & Ohio Company Medicaments, certain named, G. B. White	27,686 27,716 27,704
Medicine, tonic, alterative, and laxative, Dr. B. J. Eay Medical Company Metal bars and bearings, antifriction, C. Biobard	97,703
non Neckwear, J. K. Middleton Needles, F. P. Green. Oils and their compounds, certain, C. H. Howell &	27,736
Panaceas, domestic or infantile, Tri-Cure Com-	27,700
pany. Paper and envelopes, writing, W. H. Hasbrouck & Company Peptonate of iron, Bothschild Brothers & Company.	27,006
Perfumery and other preparations for the toilet, P. Prot & Company	27,701 27,714
Photographic dry plates, M. A. Seed Dry Plate Company Portion chowshow and like religion Gabbart &	97,085
Pills, W. T. Hanson Company	27,696 27,706
	27,708 27,718
Salves, C. J. Garland	27,702 27,707
Company Soap, tar. Pioneer Tar Soap Company Soap, toilet, Prouty-Bowler Soap Company Stamps, seals, daters, stencils, and the like, S. U.	27,713 27,710 27,711
Water closets, L. M. Russey Manufacturing Com-	m1,121

A printed capt of the specification and drawing of my patent in the foregoing list, or any patent in print succd since 1855, will be furnished from this office for element. In ordering please state the name and number if the patent desired, and result to Munn & Co., 35 Frondway, New York.

pany bisky, Gow & Ross bisky, T. Train & Company

Canadian entents may now be obtained by the control of the control

Movertisements.

ORDINARY RATES.

Inside Page. each insertion - - 75 cents a line Back Page. each insertion - - - - \$1.00 a line 23° For some classes of Advertisements, Special and Higher rates are required.

The above are constrost per again line—about eight rords per line. This notice shows the width of the has und is set in agate type. Surraviants may been advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements unust be cocleved at Publication Office as early as Thursder boreling to appear in the romoving week's issue.



AMERICAN PATENTS, —AN INTEResting and valuable table showing the number of patents
granted for the various subjects upon which petitions
have been slied from the beginning down to December
31. 1894. Contained in SCIENTIFIC AMERICAN SUPFISHENEY, No. 1602. Price 10 cents. To be had at
this office and from all newedeslers.





THE STARRETT BOX 15, Athol, U.S.A. ***********





THE ORNAMENTAL IRON INDUS-Try.—Description of the method of manufacturing wrought iron into ornamental and artistic forms. With sillustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1626. Price 10 cents. To be had at this office and from all newsdealers.



VANDUZEN STEAM PUMP
THE BIST IN THE WORLS.
Pumps Any Kind of Liquid.
Always in Order, never Glogs nor
theses. Every Fump Guaranteed.

200 to 12000 Gallons par Houri.
Cost 87 to 8725 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, 6.

FIRE BRICK FOR ALL PURPOSES. BRUOKLYN FIRE BRICK WOLKS. SS Van Dyke Street, BROOKLYN, N. Y.



rd, III.





MANUFACTURE OF STARCH FROM Maiss.—By J. Kriegner. Full details of the process. With one illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1012. Price 10 cents. Tu be had at this office and from all newsdealers.



HYPNOTISM My original method \$2, 100 pp. pam ben 100. Dr. Anderson, 8 A 3, Manonic Temple, Chicago

ARCHITECTURE, Mechanics, Seam Engineering, Mechan-ical Drawing, Electricity, R. R. and Bridge Engineering, Flumoting, Heating, Mining Enginsh Branches, Send for free circular stating subject wish to study or your trad Correspondence School of Ladustry Sciences, SCHANTON, PA.



ELECTRO MOTOR, SIMPLE, HOW TO ELECTRO MOTORS. SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which builth be driven who advantage by a current derived from a battery, and which would have smicken; power to operate a foot lathe or any machine requiring soc over one man power. Surprisingly, Societa, 17-10 de lead at this office and from all newsdealers.

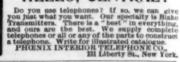


BUY TELEPHONES

That are good—not "cheap things." The difference in cost is little. We guarantee out apparatus and guarantee our customers against loss by patent allt. Our guarantee and instruments are \$10 TH \$400 D. WESTERN TELEPHONE CONSTRUCTION CO.

440 Monadnock Block, Cuicago.
est Manufacturers of Telephones in the United States

HELLO, CENTRAL!





Durable—Easily Applied.
This roofing is manufactured from natural Trinidad asphalt materials, and will not dry up and become brittle under exposure to the weather as coaltar roofings do. 18 Send for free sample of roof 12 peers old. CADY ROOFING with circular and practical war REN CHEMICAL & DIFF. CO. A DURABLE ROOFING, S5 Fulton Street, New York, U. S. A.

Reagan Feed Water Heating, Water Circulating and Shaking Grates



for Stationary, Marine, and Locomotive Boilers. AGENTS WANTED in all parts of the United States to manufacture our grates on royalty.

Send for Catalogue.

Water Circulating Grate Co.

Manuf's and Sole Proprietors
GENERAL OFFICE & WORKS,
1026-1035 Filbert St., PHILA., PA.

JAPAN AND CHINA

Do you wish to extend your trade to abovementioned countries? If so, write or call upon

BURNS, OVERTON & CO., Representing H. E. Reynell & Co., of Kobe, Japan. Constable Bidg., 5th Ave. and 18th St., New York City

Pyrometers, Barometers, Thermometers, Hydrometers,



for every purpose. In stock and made to order. Patentee and Sole Mfr. Stand. U. S. Govt. Hydrometers for Distillers. Instruments for Coal Oil, Brewers, etc. Genuine Scotch Gauge Glass, all lengths and diameters, cut to order. Hydro for dillus. cafel. X. GIUSEPPE TAG: L1A BUE. 32 Pend St. New YORK. Original House Established Ed.

THE OBER LATHES



For Turning Are, Adse, Pick, Sledge, Hatchét, Hammer, Auger, File, Knife and Chisel Handles, Whiffetrees, Yokes, Spokes, Porch Spindles, Stair Balusters, Table and Chair Legs and other Irregular work.

The Ober Lathe Co., Chagrin Fails, O., U.S.A.



NICKEL

ELECTRO-PLATING Apparatus and Material. Hanson & Van Winkle Co. Newark, N. J.

SEWAPK, N. J. 81 LIBERTY ST., N. Y. 85 & 37 S. CANAL ST., CHICAGO.

The Scientific American Reference Book.

A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed unformation over furnished to the public for so small a price, only 25 cents.

Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties: Table of Cities having over \$600 inhabitants; Map of the United States—ministure outline; The Patent Laws full text): The Trade Mark Law (full text); The Copyright Law (full taxt). The Principal Mechanical Movements—illustrated by 150 small disgrams—of value to inventors and designers of mechanism: Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Bectricity, Heaf, Metals, Weighta, and Measures.

137 Sent by most to any address on receipt of price, 25 cents.

25 cents.

MUNN & CO., Publishers, 361 Broadway, New York. Founded by Mathew Carey, 1786.

MENRY CAREY BAIRD & CO.

MENKY CARCET BARKU & CU.

INDUSTRIAL PURISHERS, BOOKKELLERS & IMPORTERS

\$10 Walnut St. Philadelphia. Pa., U. S. A.

\$7 our New and Revised Catalogue of Practical and
Scientiff Books, 90 pages, 8vo, and our other Catalogues

and Connect to the Arts, sent free and free of postage

ence of the Connection of the world who will furnish bis

address.

Science of Mechanics.

Mechanics the work is admirable."—Ingo: The Open Court Pub. Co

NEW FACTS

Concerning

ANTHRACITE COAL

WILL BE BROUGHT OUT BY

WM. GRIFFITH,

The ominent Coal and Mining expert, IN A SERIES OF ARTICLES TO BEGIN IN THE FEBRUARY ISSUE OF

The Bond Record,

RAILROADS, FINANCE and ECONOMICS.

\$3.00 per Year, with binder. 25c. per copy. Sample Copy Free on application to

The Bond Record Publishing Co. 20 NASSAU ST., NEW YORK.

poppoppopp X

VELOCITY OF ICE BOATS. A COL-lection of interesting letters to the editor of the SCIEN-TIFIC AMERICAN on the question of the speed of its boats, demonstrative and wand why it is that these craft sail its observation of the proposition of the letter of the property of the property of the pro-lemant of the property of the property of the pro-served of the property of the pro-lemant of the property of the pro-tory of the property of the property of the pro-tory of the pro-

The Chicago Gas & Gasoline Engine



The simplest gas and gasoline engine on the market. Has no equal for absolute, sicady speed and durability. It is a dwarf in size and a Samson in strength. Catalogue sent on application.

J. J. NORMAN CO.,
48 "A" South Clinton St.,
CHICAGO, ILL.

Little Giant Drilling Machine

WITH STRAIGHT TABLE.
Furnished also with swinging table
Arranged for both Hand and Power.
Drills from 1/2 to 1/2 inch hole.
Drills from 1/2 to 1/2 inch eirele.
Table is perfectly inch eirele.
Table is perfectly inch eirele.
Feed has a run of 4 inches.
Feed has a run of 4 inches.

WELLS BROS, & CO., Box B. Greenfield, Mass F. O. Box B.

HARFLM PLAR IMPROVEMENT



They have a tone that's all their own.

THE NEW are the stand-DEPARTURE lence the BELLS over. Made in 16 and prices. Send postal for booklet to THE NEW DE-PARTURE BELL CO., 210 North Main Street, Bristol, Conn., U.S. A.

EDGE TOOLS

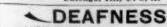
ften nearly ruined by using a grind-not adapted to the work. Our tes produce a large variety of grits le ror grinding any tool. Of grinding any let ror grinding any tool. Way we send you one. Catalogue, will give you some information? which will give you some information?

GRAFTON STONE COMPANY,
No. 80 River Street,

GRAFTON, OHIO-

DYNAMOS and ELECTRIC MOTORS are pronounced a success by all who have them in use. High grade, compound wound self ofling, self altering

self oiling, self aligning bearings, high efficiency and great durability guaranteed. Lowest prices. Do your own lighting, no experience required. Send for catalogue and prices. Complete plants furnished. Send for catalogue and prices Complete plants furnished. ROTH BROS. & CO., Mirs., 30-34 Market Street, Chicago, Ill., U. S. A.



and HEAD NOISES relieved by using Wilson's Common Sense Ear Drums

No. 2 Hammond The



ALIGNMENT-Perfect and permanent. IMPRESSION-Invariably uniform. TOUCH-Soft, light, and elastic. SPEED-206 words a minute.

> best made. VARIETY -- Twelve languages, 37 styles of type, paper or cards of any width or size on one

machine. PORTABILITY—Weighs only 19 pounds complete with traveling case.

The Hammond Typewriter Co. 401 East 62d Street, New York.

ICE-BOATS-THEIR CONSTRUCTION and Management. With working drawings, details, a directions in full. Four engravings, showing mode construction. Views of the two fastest ice-satiling but used on the Hudson river in winter. By H. A. Horsfa M.E. Contained in SCIENTIPIC AMERICAN SUPPI WENT, 1. The same number also contains the rules a regulations for the formation of ice-boat clubs, the saing and management of ice-boats. Price 10 cents,



Medical Batteries Electric Alarm Clocks. Dynamo and Motor Castings. Engine Castings. Send stamp

Palmer Bros.



Simple Construction, Fundreds in Successful Use.

Write for illustrated catalogue.

GLOBE GAS ENGINE CO...

Merion Avenue & 6th Street. PHILADELPHIA, PA

ALCO VAPOR LAUNCH. Ingine and helm controlled om bow. Latest improved and ly 12 to 1 motor now ready for market. 18 to 40 ft. launcher

Marine Vapor Engine Co., Jersev City, N. J.





.A.STALLMAN, 61W.Spring St., Columbus.O.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: I. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Ornained in the EVITAL AMERICAN SUPPLEMENT, NO. 1802. These B outs. To be had at this office and from all nowadcalors.

PSU USE GRINDSTONES? If so, we can supply you. All sizes mounted and unmounted always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ** Ask for catalogue.

The CLEVELAND STONE CO. 2d Floor, Wilshire, Cleveland, O.

THE QUICLEY

(REORGANIZED)

WHITESBORO, N. Y.

immense plant is devoted entirely to al orders. We carry nothing in stock. Our ation is the highest. We work in Ma-ny, Oak, Walnut, and Cherry. Orders solicited for

FURNITURE for PUBLIC & PRIVATE
Carving or Specialties in quantities.
Come and see our facilities, or write. WHAT CAN WE MAKE FOR YOU?





INCUBATORS

Brooders, Vegetable and Clover Cutters, BONE AND GRAIN MILLS, A complete line of poultry supplies at lowest prices. Green cut bone will MAKE HENS LAY

formation on poultry raising. Absolutely Self-Regulating. Peerless Incubator & Brooder Co. 516 A Ohio Street, Quincy, III.

\$525 Agent's profits per month. Will prove the for pay for feit. New articles just out. A #1.0 ample sent free. Try us. ELECTROGRAPH CO., 28 BOND St., N. Y.

Patent Steam Pump Governors FISHER PATENT GRAVITY GOVERNORS

For Steam Pumps filling elevated open tanks, are the most positive and durable devices made for the purpose.

#EPI-URING VALVES

#FORM for circulars and testimonials.

#INHER GOVERNOR CO...

\$60 S. ist Avenue. — Marshalltown, Icwa

\$75=\$100SALAR

Catalogue free. CHICAGO, ILL. F. C. AUSTIN MFG. CO.,

MOTOR COMPANY, DAIMLER

BUILDERS OF

Highest Grade Single and Twin Screw Launches. Safest, cleanest and speediest power boat built. No smoke or smokestack, no boiler, no elec-



Run on one pint of gasoline per horse power per hour, and are under way in less than one minute. No licensed engineer or pilot.

STUDY A HOME & Steam Engineering By our unequaled Correspondence Method. ELEC-TRICAL APPARATUS FURNISHED without extra cost. Special proposition now open. The Scientific Machinist Co., 51-52 Biackstone Bidg., Cleveland, O.

Shorthand by Mail Thoroughly taught by re-lesson Free, Potts Shorthand College, Williamsport, Pa.

SCROLL SAWS Foot Power Machinery, Tools, catalogue. Wilkinson Co., 85 Randelph St., Chicago

MACHINES. Corliss Engines. Hrewers and Bottlers' Machinery. The Ville Mrg. Co., 890 Clinton Street, Milwaukee, Wis.

RAUGHTING or SURVEYING taught a month. Positions secured. Two cent stamp for catalogue. P. O. Bex 369, Trenton, N. J.

IDEAS DEVELOPED. Absolute secrecy. Send for particulars. Advise and sagrestions free. Correspondence and sample orders solicited. 25 years in business. Gardam & Son, & John St., New York.

BI-SULPHIDE for use in the arts, Killing Insects in Grain, Killing fluorowing An-OF CARBON Innals, etc., Manufactured by E. R. TAY 1.49 R. Cleveland, Obio

"DYNAMOS," Care and Management of. 28 illustrations. Pauphlet, Price 28c.
American Industrial Publishing Compacy.
Bridgeport, Cons.

TURBINE WATER WHEELS.
BEND FOR PAMPHLET.
JAMES LEFFEL & CO.,
Springfield, Chie, U. S. A.

MODEL AND EXPERIMENTAL WORK Developing Bicycle inventions a specialty. Mechan-ical Draughting. S. P. Denison, 143-Centre St., New York

EXPERT MODEL MAKING

DEAF WESS & HEAD NOISES CURED Warranted to helts more are Cuchinus. Whitness to Warranted to help more cases than all similar devices combined. Help cars as glasses do syes, Soid by FREE y, 853 Br'dway, N. Y. Send for book of proofs FREE

SAVE TWO PROFITS We sail our on-trained lives to Consumers. Special Offer to Agents Pree, for State, Shears and Krife Sharpen-ers. Diamond Cutlery Co. 69 Bray, N. Y.







INCUBATOR.

ICE-HOUSE AND COLD ROOM .-- BY R. G. Hatfield. With directions for construction. Four engravings. Contained in Science 1912 A MERICAN SUPPLEMENT, No. 34. Price B cents. To be had at this office and from all newscepton.



VOLNEY W. MASON & CO. FRICTION PULLEYS, CLUTCHES, and ELEVATORS PROVIDENCE, R. I.





SEND for Catalogue the Musical Instrment you think of buying Violins repaired by the Cremons System. C. Scory 26 Central St., Boston, Mass



"Air Cushion" Rubber Stamps
ALWAYS MAKE A GOOD PRINT.
Stamp, Stencil and Seal Supplies.
Wholesale and Retail.
THE R. H. SMITH MFG. CO.,
Springfield, Mass.



SMALL MOTORS for All Purposes. all kinds of light work, sewing measure constoys, dental drills, fewelers' lathes, models, confort a top of the series of the se

STEREOPTICONS.
MAGIC LANTERNS AND
ACCESSORIES SEND FOR CATALOGUE TO CHAS BESELERMAKER ZISCENTRE ST. NEW YORK

ORDINARY RATES.

inoide Page, each insertion. - 75 cents a line flack Page, each insertion. - 81,00 a line For some classes of desertionants, Special and

There's no doubt about the advisability of riding a wheel—the only question now is what wheel to ride.

King of Bicycles,

represents cycle manufacture in its highest development. A wheel with which no fault can be found.

4 models. 620 and 58164 fully currenteed. For children and abults who want a lower price when! the forfance is made in 5 models, 483 to 978, feed for Bloothvin brook.

MONARCH GVCLE MFG. Co. Luke, Halated and Fullen See., CEICAGO.



ARMSTRONG'S . PIPE . THREADING



CUTTING-OFF MACHINES

Water, Gas, and Steam ers' Tools, Hinged Pipe V ine Cutters. Stocks and THE BEST. EST Send for cotalog THE ARMSTRONG MFG. CO. Bridgeport, Conn.

AGENTS WANTED FOR FINE TOOLS IN EVERYSHOP CH.BESLY& CO.

The Bartley Direct Running Saw Mill

lifest complete, compact, and substantial Portable Raw Mill now on the market. Can be set up anywhere, cance all kiness anywhere, cance all kiness anyum- basinety

WM. BARTLEY & SONS, Mirs., Bartley Station, N. J.

cientific Book Catalogue

Car Now Cutalogue containing over 10 pages, includ-ing works on more than 25ty different subjects. Will be mailed free to may address on application.

The American Bell Telephone Company,

> 125 Milk Street. Boston, Mass.

This Company owns Letters-Putent No. 463,569, granted to Emile Berliner November 17, 1391, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.



I a new Waverley Scorcher is offered to each person who recovers a stolen '96 Waverley gring 186, payable upon precentation to us of satisfactory proof of the facts and the nutcope of the third. This reward is open to every one accepting the owner of the not cayable to more than one person in any case.

IND. IND. AND BICYCLE CO., INDIANAPOLIS, IND. REWARD & stolen wheel, but is not payable to mor



At & Price Borre



VENEZUELAN COFFEE-CEYLON TEA. Unobtainable elsewhere-% pound packagem 50 cents-nailed free-Caravan Coffee Co., 388 B'way, New York

WE ARE BUILDING . . The Gelebrated-

"HORNSBY-AKROYD

The De La Vergne Refrigerating Machine Co. FOOT E. 138TH STREET, NEW YORK.

DOES PHOTOGRAPHIC-Pocket

Sample photo and booklet for two s-cent stamps.

CHICAGO - NEW YORK

EASTMAN KODAK CO. ROCHESTER, N. Y.

WESTERN WHEEL BUILDERS

"NAPOLEON" **BICYCLES** ARE SUPERB...

Catalogue Free THE JENKINS CYCLE CO.
18 and 20 Custom House Place, Chicago

10,000 Miles for \$1.00 The Ingersoll Dollar Cyclometer.



R. H. INGERSOLL & BRO., 65 Cortlandt St., New York

AMERICAN DYNAMO SCIENTIFIC f a plain abunt-wound dynamo of simple oapable of supplying a current of from the analysis of the supplying a current of from the analysis of the supplying a current of the mades of the Scientist of the readers of the Scientist of the supplying the sup

MANUFACTURE OF BICYCLES.-A





Three New Model Smith Premier Typewriters

Nos. 2, 3 AND 4 HAVE YOU EXAMINED THEM?

Many Improvements Heretolore Overlooked h THE SMITH PREMIER TYPEWRITER COMPANY, Syraouse, N. Y., U. S. A. ENGINES, Beilers and Machine Tools, No.

PRIESTMAN SAFETY OIL ENGINE

NEITHER Kerosene, NOT Gasoline NOR ENGINEER Beonomical, Simple, Safe, Au-tomatic. For Electric Light-ung, Pumping, Millboy, etc. PRIESTMAN & COMPANY, Inc. Front and Tasker Streets. - Philadelphia

There is hardly a USE OF POWER in Factory, Mill, Store, Office, Biovator, Creamery, or Shop-or on the Farm, the "CHARTER"

is not now filling. It is also renting Bosts, Well Drills, Pour Dynamos, Threshing Machinete. Of course it also uses Goline.

CHARTER GAS ENGINE CO., P. O. Box 148, Sterling, III.

. . THE . .



ESTABLISHED 1845.

The Most Popular Scientific Paper in the World Only \$3.00 a Year, including Postage. Weekly--52 Numbers a Year.

Weekly-52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteem pages of useful information and a large number of original engravings of new inventions and discoveries, representing fingineering Works, Steam Machinery, New Inventions, Novelites in Mechanics, Manufactures, Chemistry, Sectivity, Telegraphy, Photography, Architecture, Agriculture, Hortfeulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the Scientific American will be sent for one peer -62 mambers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of Three Deliars by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The asfest way to remit is by Postal Order, Draft, or Express Money Order. Mosey carefully placed inside of envelopes, securely scaled, and correctly addressed, soldom goes astray, but is at the sender's f.sk. Address all letters and make all orders, drafts, etc., payable to MUNN & CO., 361 Brondway, New York.

Scientific American Supplement

This is a separate and distinct publication from The SCIENTIFIC AMERICA's, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of watch are taken from foreign engravings. Assuring the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Riology, Geology, Mineralogy, Natural History, Geography Archaeology, Astronomy, Chemistry, Electricity, Light, Heat, Machanical Engineering, Steam and Railway Engineering, Astronomy, Chemistry, Electricity, Light, Heat, Machanical Engineering, Steam and Railway Engineering, Technology, Manufacturing Industrice, Sanitary Engineering, Agriculture, Horticulture, Domestic Recogny, Hography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT, for the United States.

and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States,
Canada, and Mexico, \$6.00 a year; or one copy of the
SCIENTIFIC AMERICAN and one copy of the SUPPLE
NENT, both mailed for one year to one address for \$7.00.
Single copies, 10 cents. Address and remit by postal

r, express money order, or check, MUNN & CO., 381 Brondway, New York.

Building Edition.

The Scussifie Assumes Buttoning Entroy is saved needing. Side year. Sincio costs, Scale. Thirty-two large quarto pares, forming a large and splendid Manastne of Architecture, rishly adorsed with elegant plate and Jibor fine energyings: Illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the intest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans. Descriptions, Locations, Estimates Cost, etc.

The elegance and choapness of this magnificent work have won for it the Largest-Circulation of any Architectural publication in the world. Sold by all newadealers. \$2.50 a year. Remit to

ndealers. \$2.50 a year. Remit to MUNN & CO., 261 Broadway, New York.

Export Edition

of the SCHERTIFIC AMERICAN, with which is incor-porated "La America Científica e Industriala." or Spanish edition of the Schertyfic American is qui-lished monthly, and is uniform in size and typography